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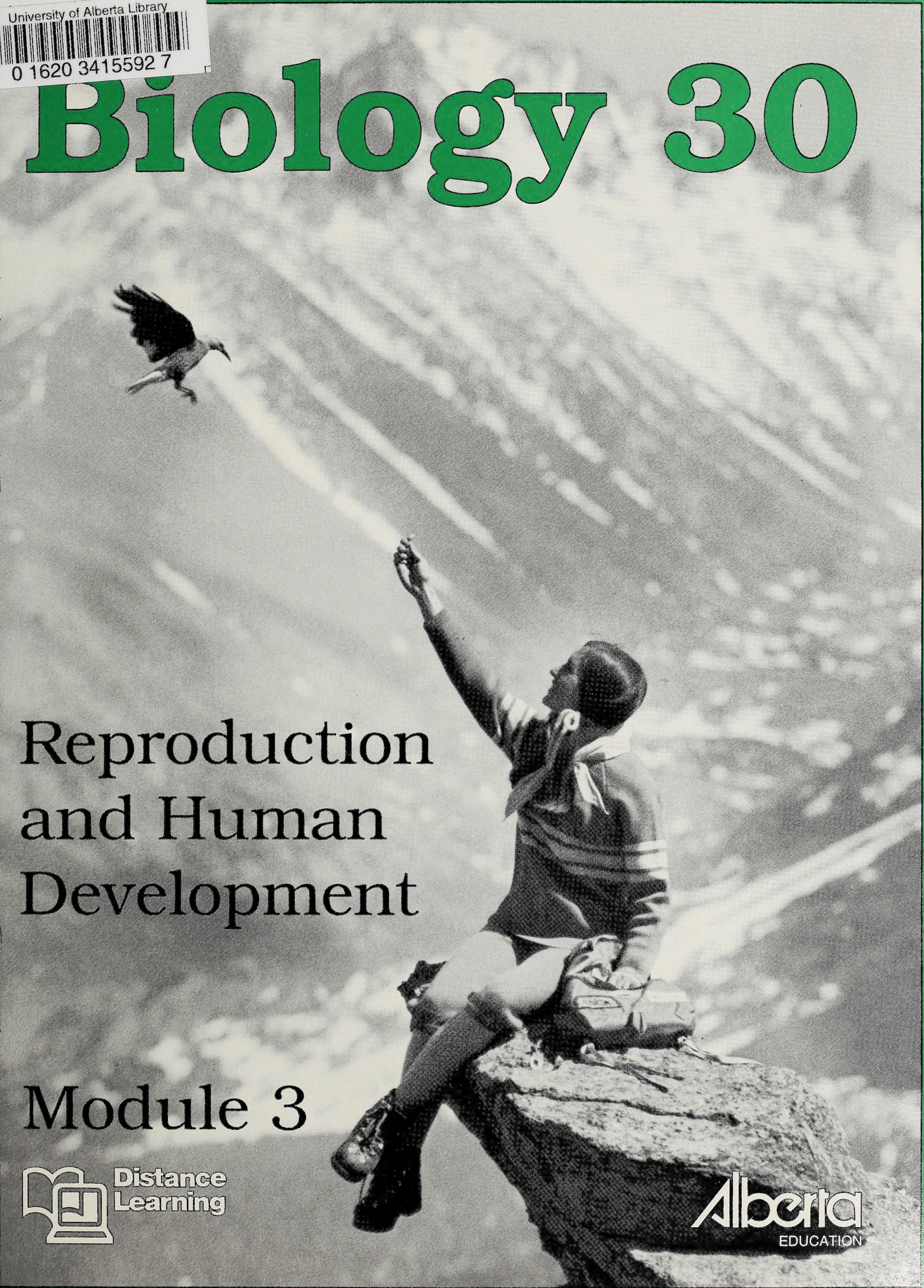

Reproduction and Human Development

Module 3

Distance Learning

Alberta
EDUCATION

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Biology 30

Module 3

Reproduction and Human Development

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Biology 30
Student Module
Module 3
Reproduction and Human Development
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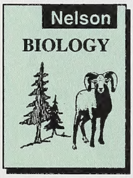
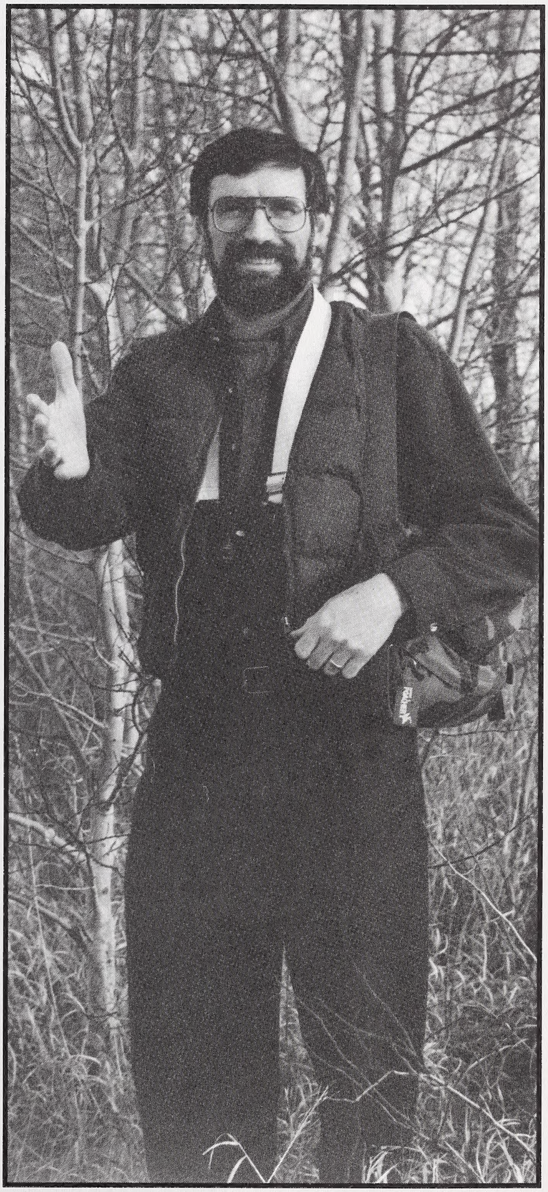
Welcome to Module 3

We hope you'll enjoy your study of *Reproduction and Human Development.* Remember, to make your learning a bit easier, several videocassettes and laser videodiscs are referred to throughout the modules. Your textbook, *Nelson Biology*, will enhance your studies.



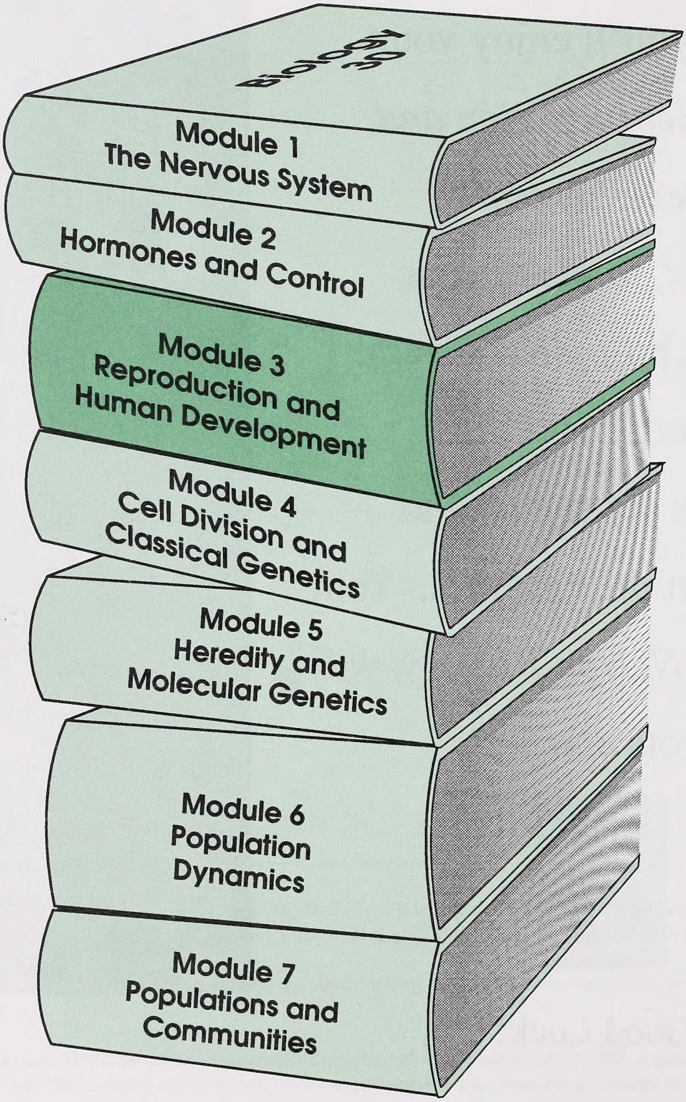


Good Luck!

COURSE OVERVIEW

This course contains seven modules. The module you are working in is highlighted in a darker colour.

Biology 30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Module 2 Hormones and Control
Module 3 Reproduction and Human Development
Module 4 Cell Division and Classical Genetics
Module 5 Heredity and Molecular Genetics
Module 6 Population Dynamics
Module 7 Populations and Communities

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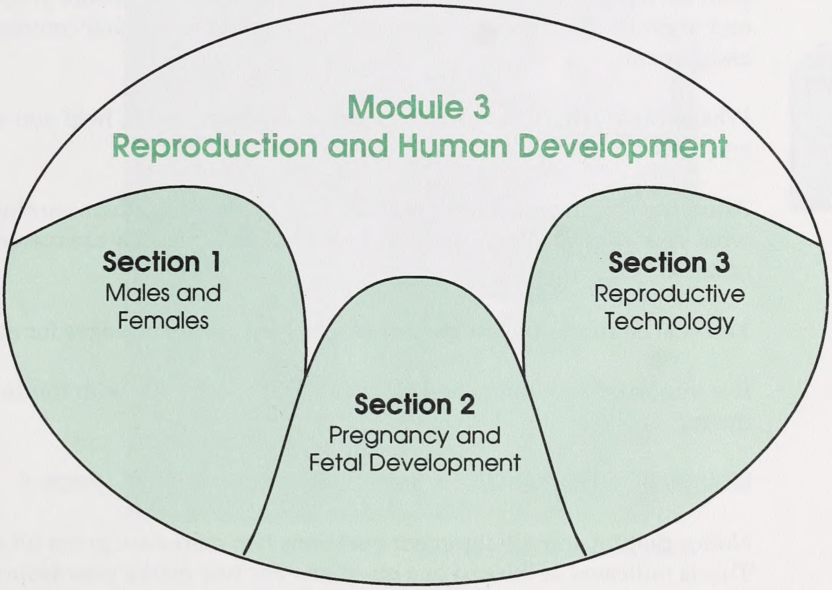
MODULE OVERVIEW

Have you ever looked up at the stars at night and wondered if there is life out there? Among the thousands of stars that you can see, there are planets, and on at least some of these planets you would think there must be life. But from all the research done by astronomers, there is not one bit of evidence so far that indicates life exists elsewhere in the universe.

You and all other living things on the Earth may be rare and unique in the universe. You eat, sleep, think, and most important you can create new life. It is the ability to create life through reproduction that keeps life on Earth. Through reproduction, all living things ensure the survival of their species – the continuation of life on Earth.

In this module you will examine the human reproductive system and study human development from a single cell to a newborn. You will also learn about some of the diseases and technologies that affect the ability to reproduce and the development of the fetus inside the mother.



Evaluation

Your mark in this module will be determined by how well you complete the assignments at the end of each section. You must complete all assignments. In this module you are expected to complete three assignments. The mark distribution is as follows:

Section 1 Assignment	**30 marks**
Section 2 Assignment	**40 marks**
Section 3 Assignment	**30 marks**
TOTAL	**100 marks**

When doing your assignments, work slowly and carefully. If you are having difficulties, go back and review the appropriate section.

Read all parts of your assignment carefully. Plan and do your rough work on your own paper. Revise and edit your responses; then set up your final copy for submission on your own paper. Lined looseleaf is recommended. Make sure your answers are neat and organized, with wide left margins and space for teacher comments after each assignment.

Response Page Setup

When you see this icon, ideas and details are provided to help you set up and organize your answer in a certain way.

Before submitting your responses, be sure to proofread them carefully to ensure they say what you want, that they are neat and clear, and that they are complete and missing no material.

You will be submitting **only** your **assignment response pages** for evaluation.

It is important to number and clearly identify each page with this information placed at the top.

Biology 30 – Module 3 Section # Assignment Page # Name and ID #

Notice that for some assignment questions two marks are given for communication. This is indicated at the end of a question. For two marks your response should clearly and logically answer the question and show strong linkages between cause and effect. Your answer should consist of complete sentences and use appropriate scientific terminology. Diagrams may be an appropriate part of your answer. An answer that requires more than one reading to be understood because it has only weak linkages between cause and effect and contains inconsistencies may only be awarded one mark or less.

SECTION 1

Males and Females

COURTESY OF TERRY SLIWKANICH

Have you ever caught a frog and wondered if it was a male or female? Could it be neither or both? In many organisms, such as most plants, both male and female sex organs are combined in the same individual. This simplifies reproduction. However, frogs are either males or females. The differences are not always obvious without careful observation, but the sexes are distinct just as in humans.

In this section you will examine the anatomy and function of the human reproductive system. You'll also learn about some common disorders.

ACTIVITY

1 Male Anatomy, Structure, and Function

Take a brief look at the upper right photo on page 423 in your text. Could you say whether this fetus is a male or a female? A male would be a good guess. Even at nine weeks of age a developing fetus has some external evidence of its gender. Internal evidence is even more obvious and equally important.

Nelson BIOLOGY

To learn more about the initial development of the male system, read the section entitled The Male Reproductive System on page 407 of your text. After you have finished reading, answer the following questions.

1. Why is it important that the testes be located in the scrotum outside of the body?
2. The wearing of tight jeans by men can affect their sperm production. Present an argument that supports this statement.
3. Following your argument in question 2, list and explain other situations that could affect sperm production.

Check your answers by turning to the Appendix, Section 1: Activity 1.

Changes occur in the male body during growth from infant to adult. Some of the more dramatic changes occur during puberty. Puberty is the period of life, usually between ten and fifteen years, when the reproductive organs become functional. Recall the production of FSH, LH, and testosterone you learned about in Module 2.

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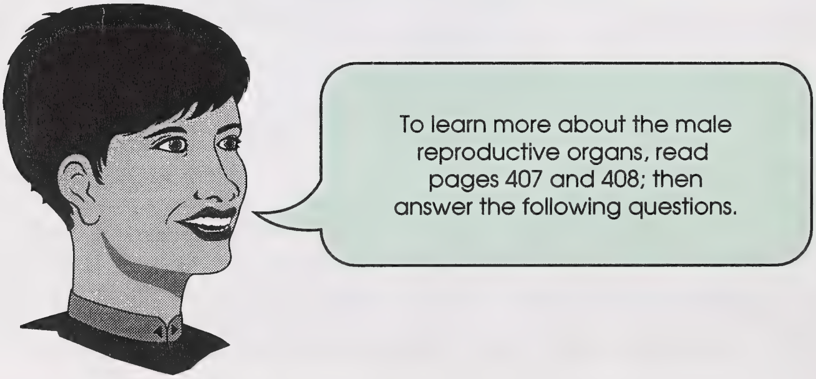
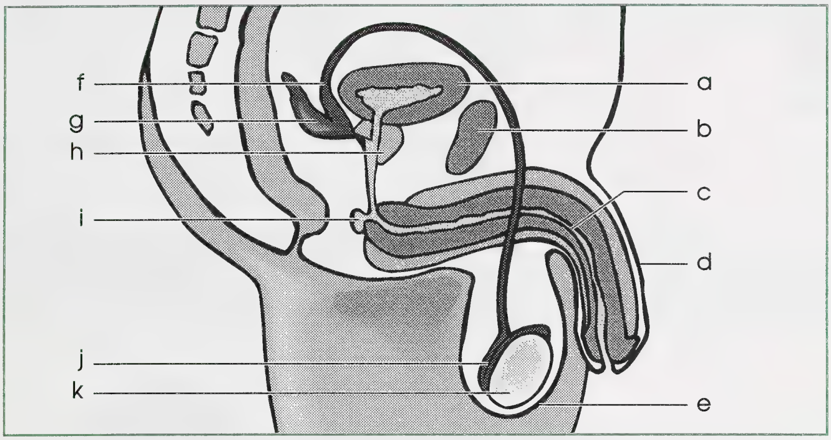

To learn more about the male reproductive organs, read pages 407 and 408; then answer the following questions.

4. Identify the labels on the following diagram using Figure 17.2 from your text.



5. Using information given on pages 407 to 410 of your text, describe the functions of the following structures:

   a. scrotum
   b. testes
   c. vas deferens
   d. seminiferous tubules
   e. epididymis
   f. seminal vesicles
   g. prostate gland
   h. Cowper's gland
   i. urethra
   j. Sertoli cells

6. What is semen? Describe its composition.

Check your answers by turning to the Appendix, Section 1: Activity 1.

The changes that occur during puberty are centred around two things – testosterone and sperm cells. You have already learned about testosterone and its effects in the previous module. It is now time to examine the sperm cell.

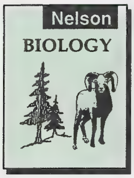
Nelson
BIOLOGY

Go to your textbook and read the sections entitled Testes and Spermatogenesis on pages 408 and 409 and Seminal Fluid on page 410 to learn more about sperm and sperm production. When you are finished, answer the following questions.

7. Using Figure 17.3 on page 408 and the information in your text, briefly describe the function of the following parts of a sperm cell.

   a. tail b. middle piece c. head d. acrosome e. nucleus

8. In a brief description, trace the pathway a sperm cell travels from its point of origin to where it leaves the body.



9. Read the Biology Clip on page 410 of your text. The author describes a seventeenth and eighteenth century practice used to keep young boys' voices from changing.
   a. Explain why this practice worked.
   b. What other effects would this have on the young boys?
10. Solvent fumes cause large numbers of sperm to have bent or broken tails. Predict the effect solvent fumes have on reproduction.

Check your answers by turning to the Appendix, Section 1: Activity 1.

Perform the following investigation to identify and estimate the size of human sperm cells.

Investigation: Sperm Cells

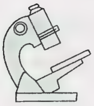
Objective

The objective of this investigation is to examine the structure and size of a human sperm cell.

Materials

- microslide viewer
- paper
- microslide Set 62 *Reproduction (Human)*
- pencil

Procedure



- Set up your microslide viewer using microslide Set 62.
- Focus on the first frame.

Observations

11. a. Draw a circle 8 cm in diameter on your paper. This represents the field of view of your microslide viewer. In this circle make a drawing of a sperm cell you see in the viewer. Describe the shape of the sperm cells.
    b. Make an estimate of cell size using the following formula:

$$\text{size} = \frac{1}{a} \times 0.12 \text{ mm (diameter of field of view of Frame 1)}$$

a = the number of times the head of the sperm cell can fit across the diameter of the field of view

Analysis and Interpretation

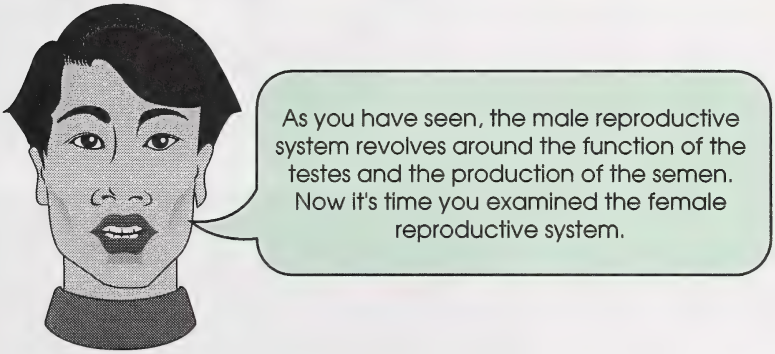
12. Using your estimate of the size of a sperm cell, how many would fit side by side in

    a. 1 mm

    b. 1 cm

13. Distinguish between the terms *sperm* and *semen*.

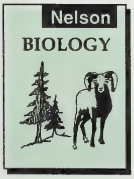
Check your answers by turning to the Appendix, Section 1: Activity 1.


As you have seen, the male reproductive system revolves around the function of the testes and the production of the semen. Now it's time you examined the female reproductive system.

ACTIVITY

2 Female Anatomy, Structure, and Function

Look at the lower left-hand photo in Figure 17.13 on page 423 of your text. Can you tell if the fetus is a male or female? Gender is not clear in this photo. Actually males and females in humans are much more alike than they are different. The chief differences are in the reproductive systems.

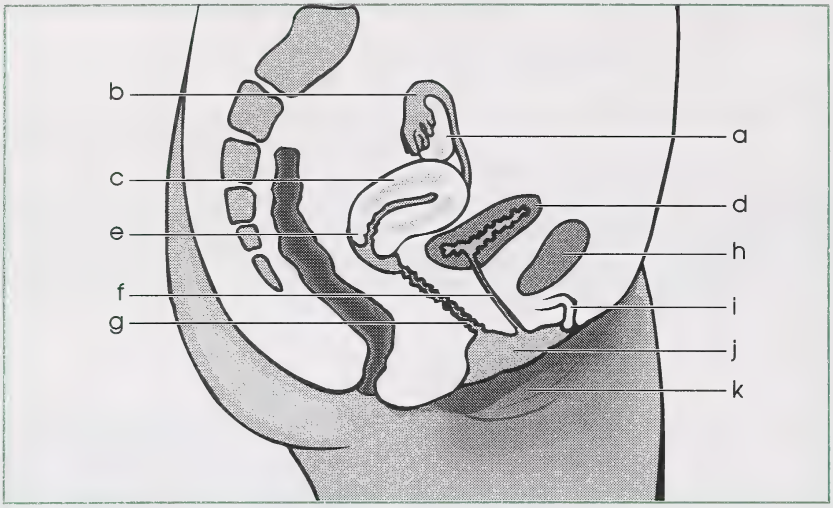


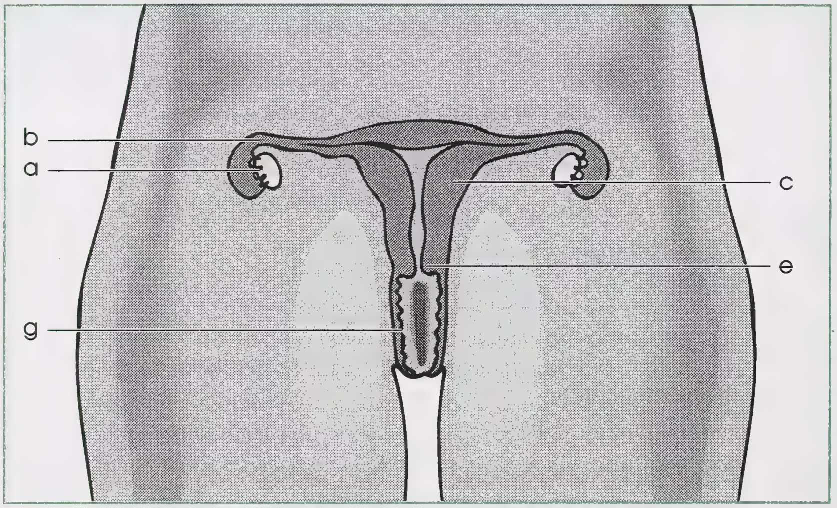
Begin your study of the structures and functions of this system by reading The Female Reproductive System on pages 412 and 413 of your text. Using this information and what you learned in Activity 1, answer the following questions.

1. What are the two functions of the ovaries?

2. What is the difference in location between the ovaries and the testes?

3. Using Figure 17.6 on page 413 of your text, identify the labels on the following diagrams.





4. Identify the function of the following structures:

a. vagina b. cervix c. ovary d. uterus e. oviduct (Fallopian tube)

Check your answers by turning to the Appendix, Section 1: Activity 2.

You should now understand that the ovaries are central to the functioning of the female reproductive system. The remaining parts are designed to bring the egg into contact with sperm and to support a developing embryo.

As you learned in Activity 1, the sperm cell is produced by the male system. The female system produces the egg. As a female enters puberty, usually between ten and fourteen years of age, changes start to occur in the ovary to bring about the production of eggs. This process occurs as part of the menstrual cycle and is called oogenesis (egg production). Refer to Module 2, Section 2, Activity 2 to review the menstrual cycle if necessary.

To learn more about egg production and egg release, read the section entitled Oogenesis and Ovulation on pages 414 and 415 of your text. Answer the following questions when you have completed the reading.

5. The normal number of chromosomes found in the nucleus of most cells in the human body is forty-six. The egg and sperm only contain twenty-three each. Explain why it is necessary for an egg and sperm cell to only have half the normal number of chromosomes.
6. Can a woman who has reached menopause become pregnant? Explain.
7. Fertility pills contain the hormone FSH which will increase egg development in the ovaries. These pills may be taken by women who want to have children but cannot become pregnant. However, what often results is multiple births such as twins, triplets, or more. Why would multiple births occur?

Check your answers by turning to the Appendix, Section 1: Activity 2.

By this point you should realize the egg cell that is released at ovulation is quite different in size and structure from a sperm cell. Perform the following investigation to examine the size and structure of an egg cell.

Investigation: Egg Cell

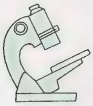
Objective

The objective of the investigation is to examine the size and structure of a human egg cell.

Materials

- microslide viewer
- paper
- microslide Set 62 *Reproduction (Human)*
- pencil

Procedure



- Set up your microslide viewer using the microslide Set 62 *Reproduction (Human)*.
- Focus on the second frame and read the description in the folder.

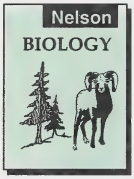
Observations

8. a. On your paper draw a circle 8 cm in diameter. This represents the field of view of your microslide viewer. In this circle make a drawing of the egg cell you see in the viewer. Note its shape and appearance. Label the parts of your drawing using information from the folder.

   b. Make an estimate of cell size using the following formula:

   $\text{size} = \frac{1}{a} \times 1.1 \text{ mm}$ (diameter of field of view of Frame 2)
   a = number of times the egg will fit across the diameter of the field of view

9. What parts of a sperm cell are not present in an egg cell?



10. Explain why an egg cell is much bigger than a sperm cell. You may wish to read pages 414 and 415 in your text for some clues to this question.

11. What do an egg cell and a sperm cell have in common? Check pages 408 and 414 in your text if you need more information.

Check your answers by turning to the Appendix, Section 1: Activity 2.

In Activity 1 you examined the male reproductive anatomy. In this activity you have learned about the female reproductive anatomy. When both systems function together, a new life can be created. However, problems can occur that have serious consequences for not only your health but your ability to create a new life. You will study some of these reproductive disorders in the next activity.

ACTIVITY 3 Reproductive Disorders

Misconceptions often come from a lack of information. By reading the following information and answering the questions, you will gain a better understanding of the problems that can happen with the male and female reproductive systems.

Can you get STDs from doorknobs or toilet seats?
Can AIDS be passed by casual contact?
Many of the ideas people have about disorders and diseases of the reproductive system are misconceptions.

Structural Disorders

Structural disorders can occur in the male and female reproductive systems. Most of these disorders are uncommon. However, one disorder that is fairly common in males is an inguinal hernia. In this disorder the intestine pushes through a tear in a thin layer of muscle that separates the testes from the lower abdomen. Part of the intestine may form a bulge just above the scrotum, or the intestine may even protrude into the scrotum.

1. Explain how lifting heavy objects or excessive bending could cause an inguinal hernia.

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You can read a brief description of this condition on page 407 in your text.

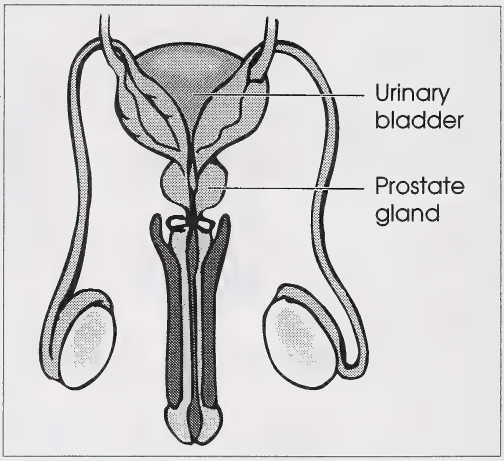
2. How could an inguinal hernia affect sperm production?

Check your answers by turning to the Appendix, Section 1: Activity 3.

Cancers

Cancers can occur in the reproductive organs of both males and females. In females it may occur in the breasts and cervix. Breast cancer is a common form of cancer and a leading cause of death in women. Women beyond the age of twenty years should examine their breasts each month for the growth of lumps. The Canadian Cancer Society recommends that healthy women between the ages of fifty and sixty-nine have their breasts examined at regular intervals with a mammogram.

Cancer of the cervix is a common female cancer. It usually occurs in women between the ages of thirty and fifty. Factors that can increase the risk of cervical cancer are contact with venereal disease, many pregnancies, an active sex life with many partners, and sexual activity at an early age.

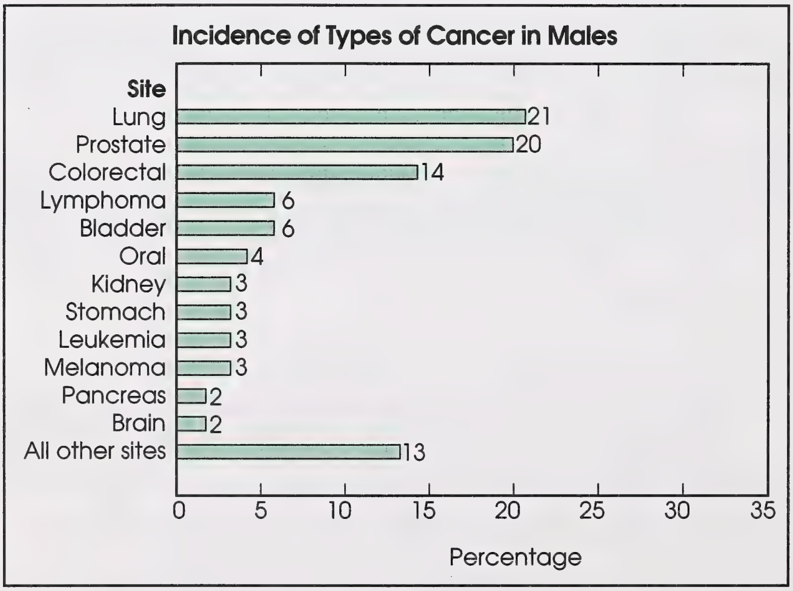


In males, cancer may occur in the prostate and testicles. Prostate cancer is a common cancer in males. It is slow growing, hard to detect, and often fatal. In this type of cancer, the prostate enlarges making urination difficult. This is often the first sign of prostate cancer, but it can indicate other disorders as well.

Testicular cancer can occur at any age, but it is more common in younger males. Doctors recommend that adult males do regular examinations of their testicles for unusual lumps.

Use the following charts and the information you have just read to answer questions 3, 4, and 5.

Distribution of Estimated New Cases and Deaths for Major Cancer Sites, Canada, 1992


Incidence of Types of Cancer in Males

[1]

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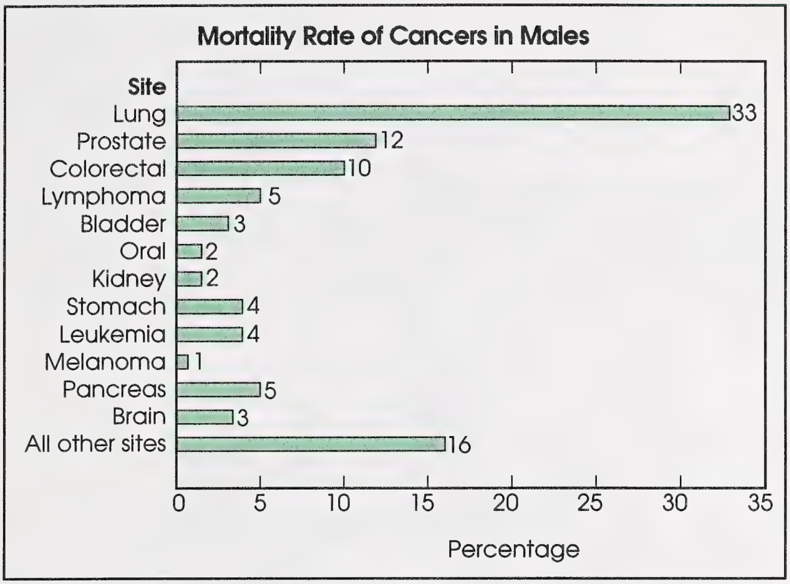
[1] Adapted from Canadian Cancer Statistics 1992. Canadian Centre for Health Information. Statistics Canada.



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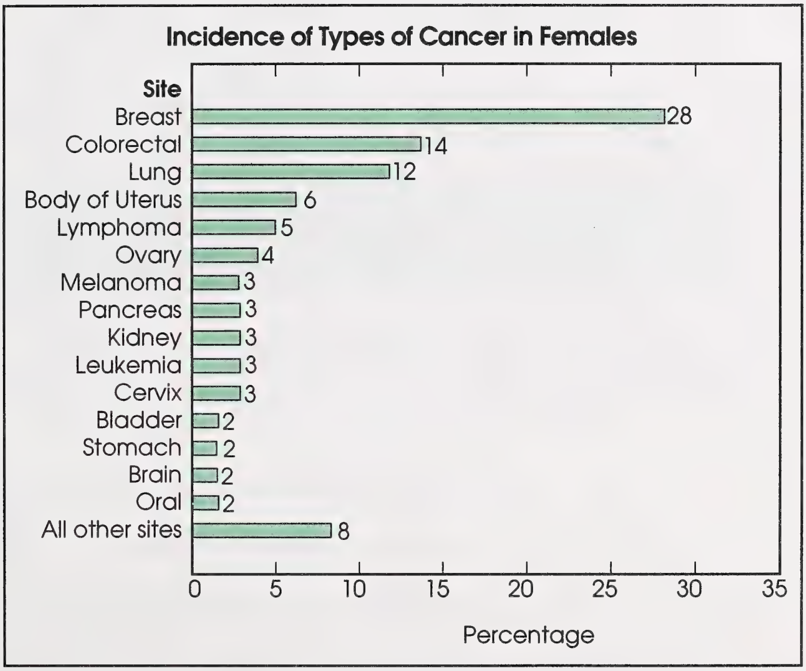

[2]

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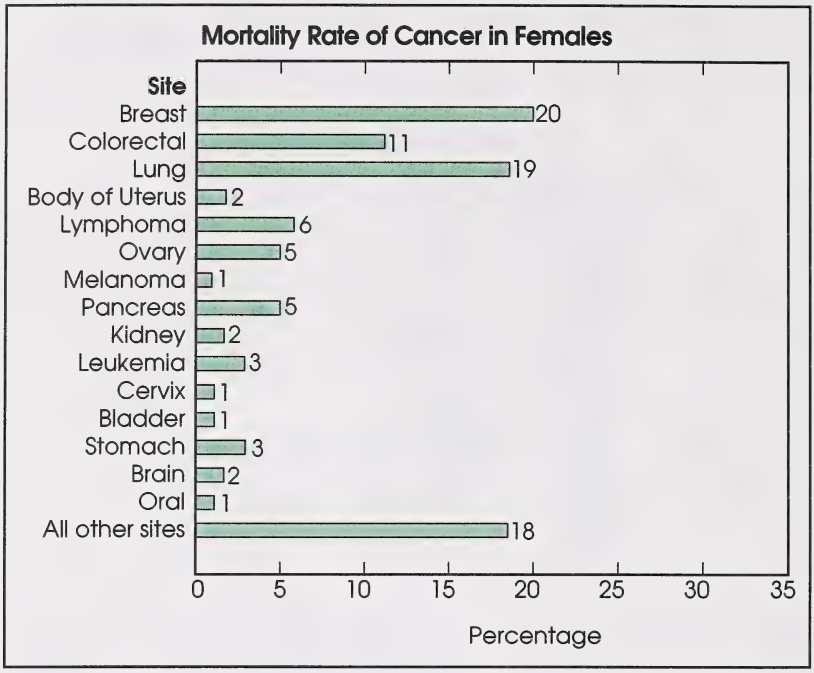
[1] Adapted from Canadian Cancer Statistics 1992. Canadian Centre for Health Information. Statistics Canada.

[2] Ibid.



[1]

3. Summarize the information about breast, cervical, prostate, and testicular cancer in a chart.

Type of Cancer	Gender Affected	Age of Most Common Occurrence	What to Look for in a Regular Examination

4. How would testicular and prostate cancer affect the male's ability to father children?

5. How would cervical cancer and breast cancer affect reproduction if untreated?

Check your answers by turning to the Appendix, Section 1: Activity 3.

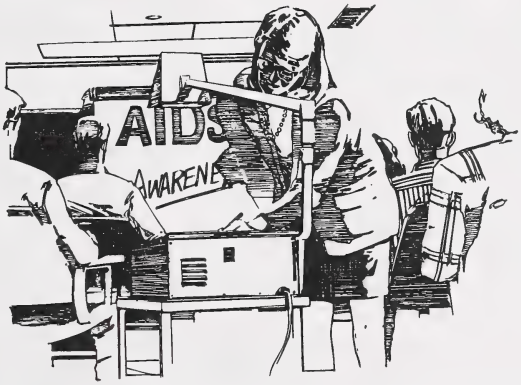
---

[1] Adapted from Canadian Cancer Statistics 1992. Canadian Centre for Health Information. Statistics Canada.

ACTIVITY

4 Sexually Transmitted Diseases

There are many disease-causing organisms associated with the human reproductive system and human reproductive behaviour. Collectively these diseases may be referred to as Sexually Transmitted Diseases (STDs). Acquired Immunodeficiency Syndrome (AIDS) is an STD, but there are many STDs other than AIDS. Some are very serious; others are less so. All can negatively affect the quality of your life.



STDs are caused by organisms such as bacteria, viruses, yeasts, and protozoans.

These organisms must have certain conditions in order to survive. They require warmth, darkness, moisture and particularly mucous membranes before they will cause infections. The openings of the body, especially in the genital area, provide these conditions.

STD organisms cannot live away from the human body and therefore do not survive on objects such as toilet seats and drinking cups, or in places like swimming pools. [1]

1. What four types of organisms generally cause STDs?
2. What three conditions are required for growth of STD-causing organisms?
3. Why are STD organisms able to grow well around the genital (sex) organs?

To learn more about the most common STDs and their physiological and physical effects, study the following tables and answer the next questions. You may also read about AIDS in your text on page 541.

---

[1] Adapted and reprinted by permission of Alberta Health from *Sexually Transmitted Diseases* brochure, 1992.

Gonorrhea

Gonorrhea (pronounced gon-or-ee-a), sometimes referred to as the 'dose' or 'clap', is caused by a bacteria called the *Neisseria gonorrhoeae*. The most likely sites for infection are the urethra in males and the cervix, urethra, and vagina in females. The throat and rectum of both sexes can also be affected and occasionally the eyes.

Gonorrhea is a very common STD, and the gonococcus is easily passed from one infected person to another during vaginal and anal intercourse and by oral sex.

Males: Symptoms will show up within a week following sexual contact with an infected person.

A discharge of pus from the urethra and mild to severe burning pain when urinating are usual. However, up to 20% of infected men will not have any symptoms.

Females: Sometimes an unusual vaginal discharge or pain on urination will occur.

80% of infected women will not notice any symptoms.

If not treated, internal scarring and blockage of fallopian tubes can cause sterility, tubal pregnancies, chronic pelvic pain and menstrual irregularities. Although not common, gonorrhea in males can cause pain and swelling in the testicles which may result in sterility.

An untreated pregnant female can pass gonorrhea to her baby's eyes during childbirth. This type of infection, which may cause blindness, can be prevented by special drops or ointment, such as 1% silver nitrate solution, or penicillin, which are put into the eyes of all newborns at birth.

Gonorrhea requires immediate medical attention and is diagnosed through special tests. These tests, called smears or cultures, will detect gonorrhea even when the infected person has no symptoms.

Gonorrhea is treated with antibiotics and can always be cured. Sex partners must be treated at the same time to ensure reinfection does not occur.

Untreated gonorrhea can lead to serious problems of the reproductive organs. Females, often unaware they have gonorrhea, frequently develop an infection of the tubes and ovaries. This is called pelvic inflammatory disease (PID) and can cause lower abdominal pain, vaginal discharge, fever and painful intercourse.

[1]

4. What are the most common sites of gonorrhea infection in males and females?
5. Which gender most commonly shows symptoms of gonorrhea? Compare males to females.
6. Why is the lack of symptoms particularly dangerous for females?
7. What may be the consequences of gonorrhea during childbirth and what is done to prevent this?
8. Although gonorrhea is treatable with antibiotics, how is reinfection most easily prevented?

---

[1] Adapted and reprinted by permission of Alberta Health from *Sexually Transmitted Diseases* brochure, 1992.

Chlamydia

Chlamydia is a bacteria that causes a very common STD. Symptoms differ between males and females. Notice the difference between NGU and MPC.

Chlamydia (pronounced kla-mid-ee-a) is the name of the bacteria that causes the most common STD. Doctors use the term nongonococcal urethritis (NGU) to describe the disease in males and mucopurulent cervicitis (MPC) when the infection is in females. Chlamydia is very similar to gonorrhea. In fact, in the past the two diseases were often confused with each other. In some cases NGU and MPC may be caused by bacteria other than chlamydia.	Males: One to three weeks after sexual contact with an infected person, there may be a clear, mucous-like discharge from the penis. Discomfort or a burning sensation in the urethra may be noted at any time but is most frequently present during urination. These symptoms are most noticeable early in the day and usually recur if the disease is not treated. Females: Usually there are no outward signs of infection. Women might notice an unusual vaginal discharge or irregular menstrual bleeding. Most often a woman is made aware of her possible infection by her male partner who has sought medical attention for his symptoms.
Chlamydia affects the genital organs the same way gonorrhea does, so similar problems can develop. Pelvic inflammatory disease is quite common in females, and males can experience problems with the prostate gland and testicles. Babies born to females with untreated chlamydia infections are at risk of developing eye or lung problems after birth.	Chlamydia infections in both males and females can only be diagnosed through special medical tests called cultures. Because chlamydia is very similar to gonorrhea, these tests are important as they will determine which disease is present. Chlamydia is curable but the antibiotics used are different than those used to treat gonorrhea. In some cases, the infection may reappear even if the medication is taken properly and all sex partners have been treated. If reinfection occurs, it is important to return to the doctor or clinic so that alternate antibiotics can be given to cure the disease.

[1]

9. How does chlamydia affect males?

10. How does chlamydia threaten newborns?

11. What difference in treatment is used for gonorrhea versus chlamydia?

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[1] Adapted and reprinted by permission of Alberta Health from *Sexually Transmitted Diseases* brochure, 1992.

Syphilis

Syphilis is one of the oldest known STDs.

Syphilis, sometimes called 'siff' or the 'pox' is a disease that can involve many parts of the body. If not treated it can result in very serious long term consequences.

Syphilis is caused by a bacterium called *Treponema pallidum*. It cannot survive outside the body and is passed on during direct contact with a syphilis sore or rash during sexual activity.

Syphilis is diagnosed by a doctor following an examination of the sore or rash. As well, a special blood test is done which detects syphilis in any of its stages.

Syphilis is treated with antibiotics such as penicillin. It can always be cured regardless of the stage, but the earlier treatment begins, the less chance there is of spreading the disease to others or of serious complications developing.

Syphilis passes through three stages and the symptoms of each stage can be mistaken for other illnesses. The symptoms are the same for both males and females.

First Stage – Primary Syphilis

Anywhere from 9 to 90 days (usually 3 weeks) after sexual contact with an infected person, a sore called a chancre (pronounced shang-ker) will develop on any part of the body where the germs entered. This is usually on or around the sex organs but can also be inside the mouth or rectum.

The chancre is a painless sore that can range from pin point size to as large as a quarter. Women and homosexual men may unknowingly have the disease because the chancre may be hidden inside the vagina or rectum.

Primary stage syphilis can be easily transmitted because the chancre contains the syphilis bacterium on its surface. Although the chancre will heal without treatment in 2 to 4 weeks, the disease is still active.

Second Stage – Secondary Syphilis

This stage, lasting 2 to 6 weeks, follows the appearance of the chancre and occurs 2 to 6 months after the initial contact with an infected person.

A rash, resembling measles or a heat rash, breaks out anywhere on the body. It often produces little bumps on the hands and feet or red patches on the skin. This syphilis rash has been called 'wine rash' or 'pox'. As well, there may be a loss of appetite, fatigue, fever, hair loss and swollen glands.

The disease is very contagious during this stage and can easily be passed to sexual partners. Even without treatment, these symptoms will disappear and the disease becomes hidden. However, the syphilis bacterium are still alive in the body and the disease can progress to the third stage.

Third Stage – Tertiary Syphilis

This stage develops anywhere from 2 to 40 years after the symptoms of the second stage have disappeared. Even though there are no obvious signs or symptoms, the syphilis bacterium may be invading and damaging vital organs. This can cause serious problems such as blindness, paralysis, deafness and brain or heart disease.

A pregnant woman with untreated syphilis may pass the disease on to her unborn child. Possible complications of syphilis during pregnancy are premature birth, miscarriage, stillbirth and congenital deformities.

[1]

12. Why is syphilis a serious STD?

13. Briefly describe the three stages of syphilis infection.

14. How may untreated syphilis affect and disrupt a pregnancy?

15. Why is early detection and treatment of syphilis important?

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[1] Adapted and reprinted by permission of Alberta Health from *Sexually Transmitted Diseases* brochure, 1992.

Vaginitis

Vaginitis or yeast infections are very common and easily recur in women. Men may carry and transmit these infections but usually have no symptoms.

Vaginitis is an inflammation of the vagina. It has several causes, but the three most common are *Monilia* or *Yeast*, *Trichomoniasis* or *Trich*, and *Bacterial vaginosis.*

These infections result in abnormal and unusual vaginal discharge and genital itching. This discharge is quite different from the normal discharge that occurs in most females during and after puberty. This normal discharge, which is harmless, is clear or slightly creamy in color, scant, odorless and causes no discomfort.

All types of vaginitis can be identified through simple laboratory testing. Once the cause is known, the infection can be easily and successfully treated.

Although the symptoms of vaginitis appear in the female, the male can also be infected and not know it. He then becomes a carrier and can reinfect his partner after she has been treated. With this in mind, he should also be examined and treated if necessary.

A yeast infection is caused by a fungus-like organism called *Candida albicans* which is often found in the vaginas of healthy women. Occasionally, due to changes in body chemistry, yeast may be stimulated to overgrow and produce symptoms of vaginitis. Some factors influencing this overgrowth are antibiotics, birth control pills and stress.

The symptoms of a yeast infection are a curdy white discharge, itching and redness in the genital area. This infection can also be passed to the male partner during intercourse. The male usually does not develop symptoms, although sometimes he might notice genital itching and a fine rash on the penis.

Trich is a type of vaginitis caused by a microscopic protozoan called *Trichomonas vaginalis*. It is acquired during sexual intercourse with an infected person.

One to three weeks after contact with trich, females usually develop a foul smelling greenish or yellowish discharge accompanied by itching in the genital area. Pain during intercourse may also occur.

The infected male partner usually does not have symptoms, but may experience a scant discharge or a slight burning on urination.

Bacterial vaginosis is a very common vaginal infection that is caused by a number of bacteria. These bacteria are commonly found in the vaginas of healthy females, but sometimes may overgrow causing vaginitis. The symptoms of discharge and itching are very similar to those of trich. Males rarely develop symptoms or require treatment.[1]

16. Briefly describe the three different organisms that cause vaginitis. Notice that yeast infection may only apply to one.

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[1] Adapted and reprinted by permission of Alberta Health from *Sexually Transmitted Diseases* brochure, 1992.

Herpes

Herpes is caused by a virus called *Herpes simplex*, which is responsible for both the common cold sore or fever blister on the mouth and for genital herpes infections involving the sex organs. There are two common sub-types of the virus: Type I is associated most often with cold sores, and Type II causes the majority of genital infections. However, both types are capable of causing an infection in either area. A less common sub-type, Type III, infects the eyes. Infection occurs on the cornea and is very painful. Vision in one or both eyes may be threatened. Type III is not really considered an STD but infection is thought to be by contact.

Herpes is passed during direct physical contact with the open sores or blisters of an infected person. This usually occurs during sexual contact, but may also happen when a cold sore on the lips of one person comes into contact with the genital area of another.

Signs of genital herpes will usually occur within one week following intimate sexual contact with an infected person, but occasionally the infection may not appear until weeks or months later.

The symptoms may begin with a tingling or burning sensation in the area of the sex organs. Fluid-filled blisters appear and soon break to form shallow, painful ulcers on the skin. This first outbreak of herpes may be accompanied by headache, fever, swollen glands or an unwell feeling.

Females usually have outbreaks on the vulva, near the anal opening or internally on the vaginal walls or cervix. Herpes infections of the cervix are usually painless but may produce a discharge and bleeding after intercourse.

In males, the blisters and sores appear most often on the penis, on the scrotum or near the anus.

Genital herpes infection may make women more likely to develop cancer of the cervix. Women with genital herpes or whose partners have genital herpes should have yearly Pap tests. The Pap test indicates signs of cancer of the cervix, which is curable if detected early.

Pregnant women who know or think they have genital herpes, or who have partners with the infection, should inform their physicians so proper precautions can be taken. If the baby comes in contact with the herpes virus during vaginal delivery, serious illness can develop.

Individuals are infectious when they have blisters and ulcers present. In order to reduce the chance of infecting a partner, it is important for infected people to refrain from sexual contact from the time the sores are about to appear (that is, when the tingling or burning starts) until the sores have completely healed.

Herpes infections must be diagnosed by doctors and specially trained personnel who will examine the blisters and ulcers. A culture test is used to detect the herpes virus in the sores.

At present there is no cure for genital herpes. During an outbreak, physicians often prescribe medication to relieve discomfort. Keeping the affected area as clean and dry as possible does help healing.

Acyclovir, a medication that interferes with viral replication, may speed the healing of outbreaks and reduce the frequency of recurrences. It is available by prescription.[1]

17. What sort of organism causes herpes?
18. Compare treatment to cure in the case of herpes infections.
19. What secondary disease may develop in women with genital herpes?

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[1] Adapted and reprinted by permission of Alberta Health from *Sexually Transmitted Diseases* brochure, 1992.

Acquired Immunodeficiency Syndrome (AIDS)

Acquired Immunodeficiency Syndrome (AIDS) is an infection caused by the Human Immunodeficiency Virus (HIV).

The body is usually protected from illness by the immune system (defense system), but when HIV infects the body, it weakens the immune system by destroying certain immune system cells. The infected person becomes vulnerable to unusual infections and cancers. When the immune system becomes damaged beyond repair, these infections and cancers overwhelm the body, resulting in the final stage of HIV infection (called AIDS). The eventual outcome is death.

The virus is found in all body fluids of an infected person, but it is only transmitted in blood, semen, vaginal secretions and breast milk. This means that it is transmitted in the following ways:

- sexual contact with an infected person
- exposure to infected blood (This may occur during activities such as sharing syringes and needles, tattooing, ear piercing, blood rituals such as "blood brothers" and acupuncture.)
- from infected mother to unborn or breastfed baby

Since 1985, all blood and blood products are screened for the HIV antibody and the risk of infection through blood transfusions is extremely low.

There is no evidence of HIV transmission in any other body fluids. HIV is not spread by casual contact such as hugging, shaking hands, sharing bathroom facilities, or on objects such as drinking fountains, telephones or clothing.

A person can have the virus but may not become ill or develop AIDS. However, an infected person is still capable of passing the infection on to others. An infected person may experience the following:

- *Initial infection* – Flu-like symptoms may occur approximately three to four weeks after infection. Usually this stage goes unnoticed.
- *Infected and well* – No symptoms or signs are present, but the blood test is positive.
- *Infected and ill* – A combination of persistent symptoms may occur such as weight loss, fatigue, fever, night sweats, dry cough, diarrhea, swollen lymph glands, memory loss, confusion and depression. Persistent means these symptoms last many weeks and months.
- *Infected and diagnosed with certain infections, cancers or mental disorders*

A diagnosis of AIDS is made by a doctor based on symptoms, special blood tests and/or the presence of unusual infections or cancers.

At this time there is no vaccine to prevent HIV infection and there is no cure once a person is infected. Treatment for the infections and cancers can extend the life of most people with AIDS, but does not cure the HIV infection.

HIV infection can be avoided by not coming into contact with blood, semen or vaginal secretions.

The most common method of transmission is through sexual contact. Anyone who is infected can pass the virus to others. Since some people may not have symptoms and may look healthy, it is impossible to know who is infected. Safer sexual practices will prevent spread of this infection and **must be used at all times**.

Contaminated blood must enter another person's blood stream to cause infection. To prevent HIV infection through blood contact it is very important to

- never share needles or syringes
- avoid unsterile equipment used for tattooing, ear piercing and acupuncture
- never intentionally exchange blood with anyone

Women who may be at risk for HIV infection should seek counselling before becoming pregnant or breastfeeding.

[1]

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[1] Adapted and reprinted by permission of Alberta Health from *Sexually Transmitted Diseases* brochure, 1992.

20. What body system does the AIDS virus (HIV) affect?

21. Name four body fluids that can transmit the AIDS virus.

22. There is no evidence yet that AIDS is spread by casual contact. What is meant by casual contact?

23. Briefly describe the four infections experienced by a person carrying HIV.

24. How is HIV detected?

25. Although AIDS cannot be cured, how may treatment help an infected person?

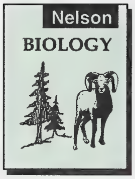
26. Describe five conditions that may indicate an STD infection.

Check your answers by turning to the Appendix, Section 1: Activity 4.

Follow-up Activities

If you had difficulties understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help



1. Match the term from the list to the phrase that best describes it. Refer to pages 407 through 410 if you need assistance, but try the exercise first before using your text.

i. prostate gland
ii. vas deferens
iii. scrotum
iv. testes
v. epididymis
vi. Cowper's gland
vii. urethra
viii. Sertoli cells
ix. seminal vesicle
x. seminiferous tubules
xi. semen

a. ______ conveys sperm from epididymis to ejaculatory duct

b. ______ cells which provide nourishment to developing sperm

c. ______ a mixture of sperm and fluids

d. ______ the place where sperm mature and are stored

e. ______ produces sperm and testosterone

f. ________ carries both urine and semen

g. ________ hold the testes outside the body

h. ________ produces a mucus fluid added to sperm

i. ________ produces a sugar solution added to sperm

j. ________ where sperm cells are produced and grow

k. ________ produces a buffer solution added to sperm

2. Complete each of the following statements.

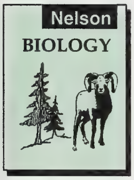
   a. The two ______________ are the primary sex organs of the female.

   b. The ______________ is a growth chamber for the fetus.

   c. The ______________ connect the ovaries to the uterus and carries the ovum.

   d. The passageway for the delivery of a baby and the menstrual flow is the ______________.

   e. A muscular opening to the uterus is the ______________.



3. Compare Figure 17.3 on page 408 to Figure 17.10 on page 420. What parts of the sperm on page 420 can you identify?

4. Semen has an alkaline pH. How would this alkalinity help to keep the sperm alive in the vagina? What gland is important in producing the alkalinity in semen?

5. Suggest some methods you would use to teach teenagers about the hazards of contracting sexually transmitted diseases.

6. Using your text and what you've already learned, fill in the following blanks.

   a. The ______________ ______________ contributes to the seminal fluid (semen) a secretion containing buffers that protect sperm cells from the acidic environment of the vagina.

   b. The ______________ is the cap found on sperm cells. It contains packets of enzymes that permit the sperm cell to penetrate the gelatinous layers surrounding the egg.

   c. The ______________ is a muscular band that prevents the fetus from prematurely entering the birth canal.

d. ______________ marks the termination of the female reproductive years.

e. ______________ ______________ contributes a mucus-rich fluid to the seminal fluid.

f. ______________ are the male gonads or primary reproductive organs. Male sex hormones and sperm are produced here.

g. The ______________ is the sac that contains the testes.

h. The ______________ is the passageway through which an ovum moves from the ovary to the uterus or womb.

i. The ______________ is the female organ in which the fertilized ovum normally becomes embedded and in which the embryo and fetus develop.

j. ______________ is the male sex hormone produced by the interstitial cells of the testes.

k. The ______________ ______________ are the tubes that conduct sperm toward the urethra.

l. The ______________ is located along the posterior border of the testis and consists of coiled tubules that store sperm cells.

m. ______________ ______________ nourish sperm cells.

n. ______________ ______________ are coiled ducts found within the testes where cells divide and differentiate.

o. The ______________ ______________ contribute fructose and prostaglandins to seminal fluid.

Check your answers by turning to the Appendix, Section 1: Extra Help.

There are many infections and diseases that can affect the male and female reproductive systems. Following are brief descriptions of a few of the more common afflictions:

Read these descriptions and answer the next questions.

- **Pelvic Inflammatory Disease (PID)** – This is an infection that may cause scar tissue that seals the Fallopian tubes and damage the ovaries. It is one of the leading causes of infertility in women. It results from untreated sexually transmitted diseases (STD) and is treated by using antibiotics or surgery.

- **Gonorrhea** – This is the most common type of all STDs. It is caused by a bacterium that in males causes painful urination and urethral discharges. In females it may cause lower abdominal discomfort, among other symptoms, but often it has no symptoms. It can spread to the uterus and Fallopian tubes causing PID. It is usually treated with penicillin; however, new strains of the bacteria are resistant to several antibiotics and can no longer be treated successfully.

- **Chlamydia** – This infection is caused by a bacterium and it is often transmitted through sex. It causes itching and burning in the male urethra. In females it causes abdominal pain, vaginal itching and discharge, and it can result in PID.

- **Herpes** – There are two common types of the herpes virus – Herpes Type I causes cold sores and Herpes Type II is responsible for genital herpes. Genital herpes causes blisters and a rash on the genitals. In some people a fever occurs. There is no cure for genital herpes – only a treatment for the symptoms.

- **AIDS** – This acronym stands for **A**cquired **I**mmune **D**eficiency **S**yndrome. It is caused by a virus that destroys the immune system. This allows other infections to damage the body. The symptoms vary. In some a minor illness occurs early on, while in others no symptoms appear for years. However, eventually AIDS will result in respiratory infections, skin tumours, and death. There is no cure, but current treatments are able to slow the progress of the disease.

7. Summarize the four sexually transmitted diseases by completing the following chart.

STD	Symptom	Treatment

8. a. How can untreated Pelvic Inflammatory Disease (PID) affect a woman's ability to become pregnant?

   b. In what ways are Herpes Type II and AIDS similar? In what ways are they different?

9. Explain how a virus or bacterium could be transmitted from one partner to another during sexual contact.

Check your answers by turning to the Appendix, Section 1: Extra Help.

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Enrichment

1. Do questions 1 and 3 from Applying the Concepts on page 428 of your text.
2. Research the reproductive diseases vaginitis and prostatitis.

3. Find out more about the sexually transmitted diseases herpes, AIDS, gonorrhea, and chlamydia by contacting your nearest Public Health Clinic.

4. Write to the Canadian Liver Foundation and ask for the pamphlet *We All Need Love – No One Needs Hepatitis B*. The address is

   Canadian Liver Foundation   P.O. Box 31024   T5J 4K7
   Edmonton Chapter   Edmonton, AB   465-1996

Check your answers by turning to the Appendix, Section 1: Enrichment.

Conclusion

In this section you examined the anatomy of both the male and female reproductive systems. You learned what happens when they work properly and what can happen when things go wrong. Keep in mind that the reproductive system is closely associated with the endocrine (hormonal) system you studied in Module 2. The major function of both is to produce sperm and egg cells. However, the female system has another major function. This function will be the focus of the next section.

30

Section 1 Assignment: Males and Females

Review the Evaluation information found in the introductory pages of this module.

Response Page Setup

It is important to number and clearly identify each page with the following information at the top:

Biology 30 – Module 3   Section 1 Assignment   Page #   Name and ID#

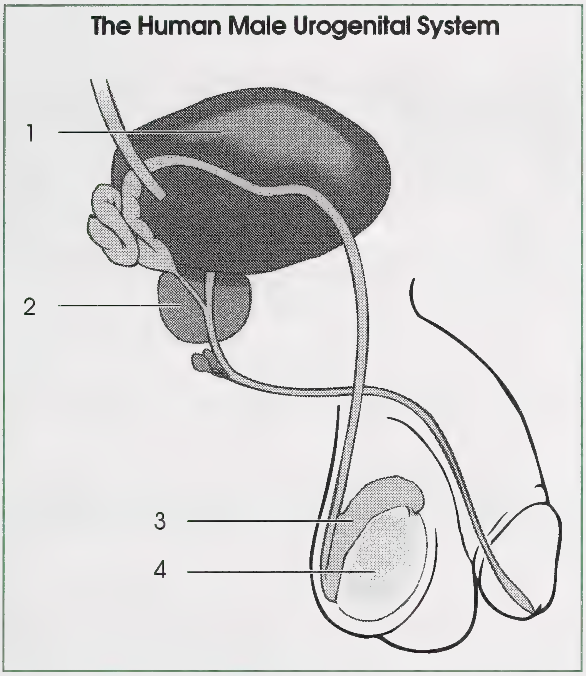
Be sure to write legibly. Leave a wide left margin and number all of your pages.

Carefully read each of the following multiple choice questions and decide which of the choices **best** completes the statement or answers the question. Each question is worth 1 mark.

1. In human females, the structures involved in egg formation, egg transport, and embryo implantation **respectively** are

   A. follicle, Fallopian tube, and endometrium
   B. Fallopian tube, endometrium, and follicle
   C. Fallopian tube, follicle, and endometrium
   D. follicle, endometrium, and Fallopian tube

Use the following diagram to answer question 2.



2. Which row correctly describes a function of each of the four labelled structures? You may wish to review pages 410, 411, 417, and 418 to carefully answer this question.

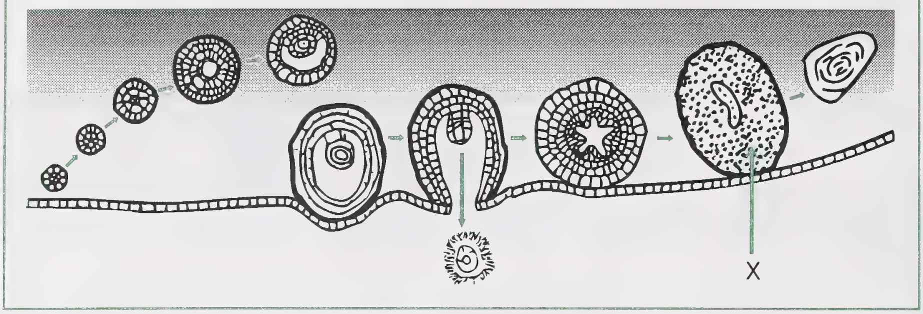
Row	Structure 1	Structure 2	Structure 3	Structure 4
A	stores nitrogenous wastes	controls fluid movement in ureters	stores sugar-rich fluid	produces sperm in response to FSH
B	receives fluid from ureters	adds secretions to semen	stores mature sperm	produces a hormone in response to LH
C	produces urine	produces a sugar-rich fluid	produces sperm	stores nitrogenous wastes
D	eliminates urine via the urethra	stores urine	produces sex hormones	stores mature sperm

3. Which reproductive structures are **least** similar in function?

A. interstitial cells of testes and follicles of ovaries
B. testes and ovaries
C. vas deferens and Fallopian tubes
D. seminiferous tubules and uterus

Use the following diagram to answer question 4.

A Sequence of Events in a Mature Human Ovary



4. The structure labelled X produces

   A. the next egg to mature
   B. progesterone
   C. FSH
   D. LH

5. In a human female's menstrual cycle, the uterus does **not** shed its lining if

   A. the Fallopian tubes are blocked
   B. progesterone levels decrease
   C. progesterone levels are kept high
   D. the corpus luteum has degenerated

6. Sterility in males could be a result of

   A. blockage of both ureters
   B. nonfunctional seminiferous tubules
   C. the presence of fructose (sugar) in the semen
   D. a scrotal temperature of slightly less than 37°C

7. Spermatozoa are to seminiferous tubules as oocytes are to

   A. Fallopian tubes
   B. uterus
   C. eggs
   D. ovarian follicles

8. The acidity of the female reproductive tract is neutralized by fluid from the

   A. vagina during sexual stimulation
   B. seminal vesicles
   C. prostate gland
   D. testes

9. The correct pathway an egg travels is

   A. ovary – Fallopian tube – urethra
   B. Fallopian tube – urethra – uterus
   C. Fallopian tube – uterus – urethra
   D. ovary – Fallopian tube – uterus

10. Which statement best describes the effect of temperature on sperm production?

    A. Increasing temperature decreases the number of viable sperm cells.
    B. Decreasing temperature decreases the number of viable sperm cells.
    C. Increasing temperature increases the number of viable sperm cells.
    D. Temperature has no effect on sperm cell production.

11. Compare the male and female reproductive systems by completing the following chart. **(5 marks)**

Characteristic	Males	Females
cell produced		
name of organ that produces cell		
location of organ that produces cell		
quantities of cell produced through life		
duration of cell production through life		

12. List two organs in the male reproductive system and one organ in the female reproductive system where cancer can occur. Explain the effect cancer has on each organ. (**8 marks;** 6 marks for content and 2 marks for communication)

Science Skills

☐ A. Initiating
☐ B. Collecting
☐ C. Organizing
☐ D. Analysing
☑ E. Synthesizing
☐ F. Evaluating

13. Sexually transmitted diseases (STDs) are one of the leading causes of infertility. They can have severe effects on both the male and female reproductive systems.

    Explain how STDs can interfere with passage of sperm and eggs. In each of your explanations use two examples of STDs to illustrate these effects. (**7 marks;** 5 marks for content and 2 marks for communication)

Reproduce the science skills assessment box after your response to this question. Remember to indicate your evaluation of your skill level for each identified science skill. Be sure to include the spaces for teacher assessment.

Self: A. ☐	B. ☐	C. ☐	D. ☐	E. ☐	F. ☐
Teacher: A. ☐	B. ☐	C. ☐	D. ☐	E. ☐	F. ☐

SECTION 2

Pregnancy and Fetal Development

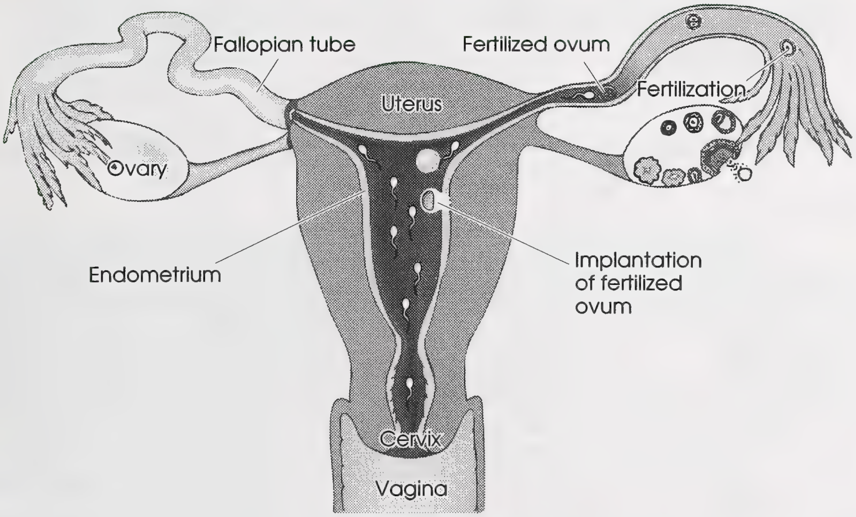
COURTESY OF ROXANNE GOERZ

It looks so simple – one sperm cell combines with one egg cell and nine months later a baby is born. From two cells, each much less than a millimetre in size, a 3 kg baby develops. A living organism who is capable of movement, communication, and thought is developed in just nine months.

The development of a baby from fertilization to birth is still one of the most remarkable and complex processes that occurs in humans. In this section you will learn about these processes as well as examine some of the problems that can occur.

ACTIVITY

1 Fertilization and Implantation



The life of a new organism begins at the moment of conception. Only one sperm cell will enter and fertilize an egg. At that moment, conception has occurred and a new life has begun. Conception and fertilization are synonymous.

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Look at Figure 17.10 on page 420 of your text. This picture is an electron micrograph of a sperm cell about to penetrate the outer protective layer of the egg. Sperm cells can survive in the female reproductive tract for up to seventy-two hours. An egg is usually viable for twelve to twenty-four hours. Combining the lifetime of sperm and egg, chances of conception may extend for up to about five days during a menstrual cycle.

Read the first two paragraphs on page 420 to learn more about fertilization and implantation. When you are finished reading, answer the following questions.

1. Define the following terms:

   a. zygote   b. blastocyst   c. implantation

2. Once one sperm cell has entered the egg, the membrane of the egg changes thus preventing any other sperm cell from entering. Explain why this change must happen.

3. It is estimated that in one ejaculation the male releases 100 000 000 to 300 000 000 sperm cells into the vagina. How many cells reach the Fallopian tubes? Explain what happens to the rest.

4. If intercourse occurs three or more days after ovulation, can conception occur? Explain your answer.

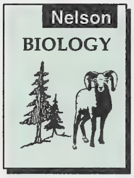
5. Identify where each of the following processes occur.

   a. ovulation b. fertilization c. implantation

6. Trace the pathway a sperm cell follows from ejaculation in the vagina to fertilization of the egg.

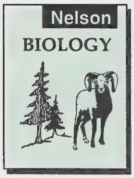
Check your answers by turning to the Appendix, Section 2: Activity 1.

The process of implantation occurs over several days. On about the sixth day after conception, the blastocyst attaches to the endometrium and starts to produce digestive enzymes allowing the blastocyst to sink into the vascular lining of the uterus. The blastocyst then begins to produce tiny finger-like extensions that grow into the endometrium. Implantation is usually completed by the fourteenth day after ovulation – the time when the endometrium is usually shed by menstruation.



Usually the blastocyst becomes implanted in the upper portion of the uterus. However, sometimes implantation occurs in the Fallopian tube. Read about an ectopic pregnancy on page 413 in your text.

7. Will the embryo continue to develop normally if it implants in the Fallopian tube? Explain your answer.



Now read the rest of the section titled Fertilization and Pregnancy on pages 420 and 421 of your text. Then answer the following questions.

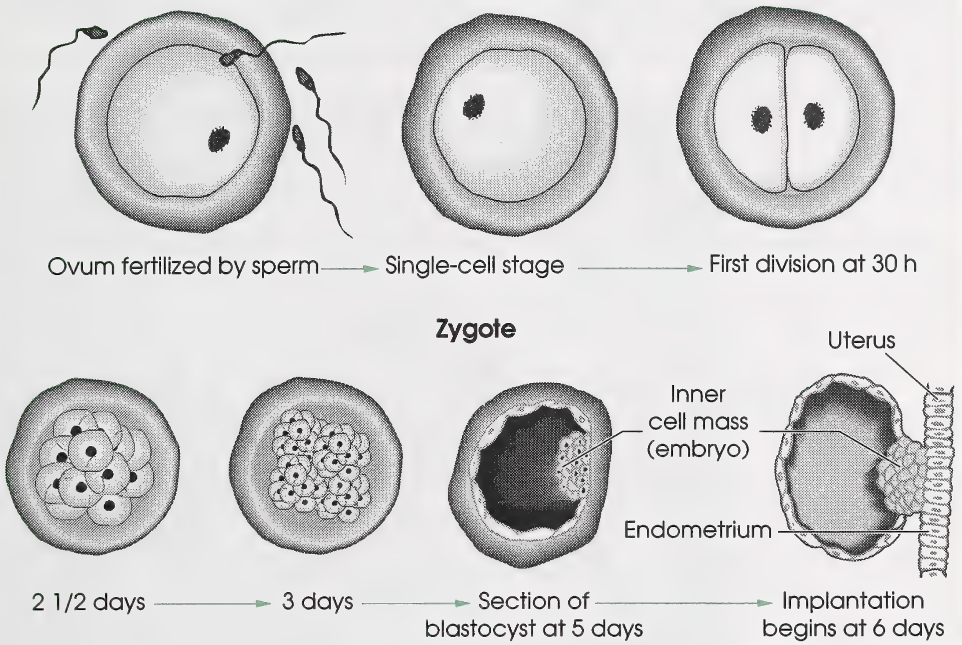
8. Explain why a woman's menstrual period stops when she becomes pregnant?

9. If implantation has occurred but a woman then has a normal menstrual flow, will she still be pregnant? Explain your answer.

The hormone HCG is produced during pregnancy by the developing embryo.

10. What does HCG mean and what is the function of this hormone?

Check your answers by turning to the Appendix, Section 2: Activity 1.



The First Six Days in the Life of an Embryo

Look closely at each of the previous illustrations. Notice the number and size of cells. Changes that occur in the early development of the embryo include the growth and proliferation of cells, the formation of the blastocyst and the embryo, and the attachment to the uterus.

blastocyst – a hollow ball of cells formed by the developing embryo

To check your understanding of the early development, answer the following questions.

11. Describe two changes that occur in the zygote/embryo during the first six days.

12. Predict what would happen to the embryo if it could not attach to the uterus.

Check your answers by turning to the Appendix, Section 2: Activity 1.

In the next activity you will examine many more changes as the embryo develops into a mature fetus ready for birth.

ACTIVITY

2 Embryonic Development and Birth

Now it is time to look at how a ball of cells that attaches to the uterus becomes a 3 kg to 4 kg baby.

Development

extraembryonic – cells forming membranes around the embryo

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BIOLOGY

In Activity 1 you saw how the embryo begins to develop from the blastocyst. The remaining part of the blastocyst will develop into several other extraembryonic tissues (membranes). These include the amnion, chorion, and allantois. A part of the chorion, together with the endometrium, will form another extraembryonic structure, the placenta. All of these extraembryonic structures and tissues function to support the embryo and later the fetus. Carefully examine Figure 17.12 on page 422 in your text. Notice the change in the size and shape of the amnion as it grows to surround the embryo.

Meanwhile, the cells of the embryo continue to divide producing three types of embryonic tissue: the endoderm, the ectoderm, and the mesoderm. *Ecto* means outer, *meso* means middle, and *endo* means innermost. *Derm* or *dermis* refers to tissue layers. These three layers will develop into all the body systems.

Nelson BIOLOGY

Read Prenatal Development on pages 421 and 422 to learn about the extraembryonic membranes and early embryo development. Answer the following questions when you are finished reading.

1. State the function of each of the following structures:

   a. chorion b. amnion c. placenta d. umbilical cord

2. Explain the difference between extraembryonic and embryonic membranes.

3. In what direction do the following substances diffuse across the placenta? Explain why diffusion occurs in this direction.

   a. nutrients and oxygen b. wastes and carbon dioxide

4. Summarize Table 17.3 on page 422 by completing the following table.

Body System	Germ Layer Origin
circulatory	
nervous	
muscular	
digestive (lining)	
reproductive	
excretory (kidney)	
respiratory (lining)	

Check your answers by turning to the Appendix, Section 2: Activity 2.

To examine the early development of the embryo, do the following investigation.

Investigation: Development

Objective

The objective of this investigation is to observe the early stages of development of a human embryo.

Materials

- microslide viewer
- microslide set 62, *Reproduction (Human)*

Procedure

- Set up your viewer using the *Reproduction* (Human) microslide.
- Observe slides 3, 4, 6, 7, and 8, and read their descriptions in the booklet.

Observations

5. The cell in Slide 3 has two dark circles inside it. What are these dark circles and what is found inside them?

6. Would the cells in Slide 4 be larger or smaller than the cell in Slide 3? Explain your answer.

7. Carefully examine Slide 8. Describe two advantages to the finger-like villi in the membrane surrounding the embryo.

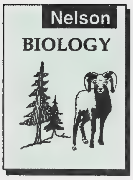
8. What structure in Slide 8 will form arms and legs?

Analysis and Interpretation

9. How many divisions are required to form the thirty-two-cell embryo in Slide 6?

10. Would the structure in Slide 6 contain any extraembryonic membranes? Explain your answer.

Check your answers by turning to the Appendix, Section 2: Activity 2.



Look at the pictures (Figure 17.13) on page 423 of your text. These pictures illustrate growth as the embryo changes into a fetus and starts to take human form.

The development of the embryo and fetus is arbitrarily divided into three three-month sections or trimesters. During this time all body systems develop and begin to grow.

Read the rest of the section Prenatal Development on pages 422 to 423 in your text. Using this information, summarize the events that occur in the three trimesters by answering the following questions.

11. At what time in development does the embryo become a fetus?

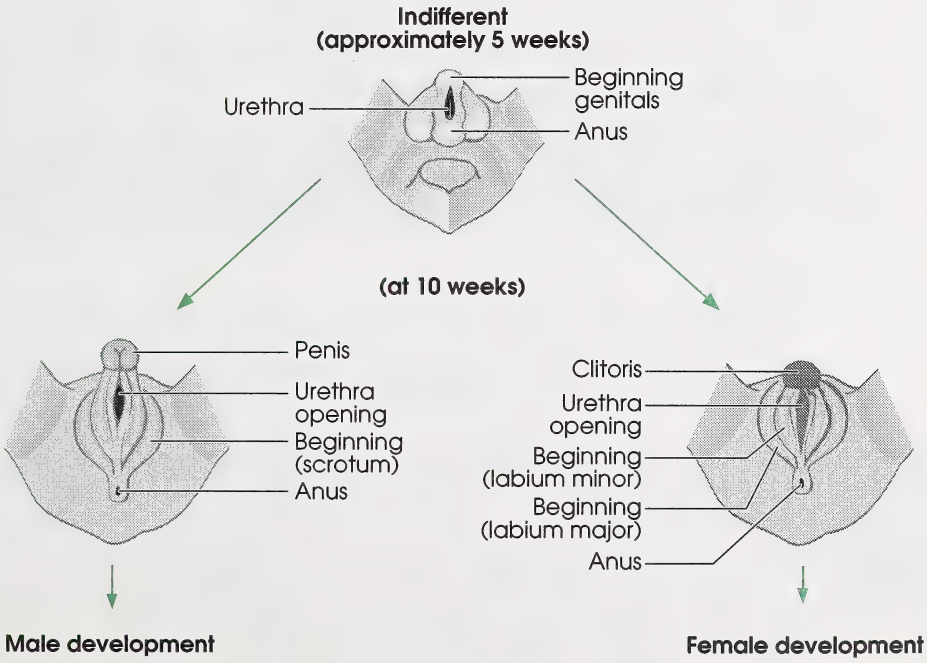
12. Complete the following table.

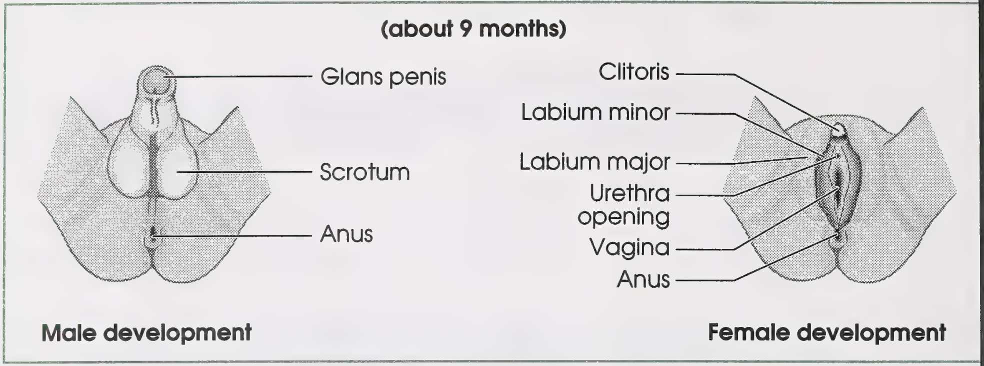
Trimester	Duration	Length of Embryo/Fetus	Changes
1			
2			
3			

Check your answers by turning to the Appendix, Section 2: Activity 2.

One of the many events that occur during development is the formation of the sex organs of the fetus. The sex of the fetus is determined at conception by the genes carried in the sperm cell. However, the development of both internal and external reproductive organs does not occur immediately. The diagrams that follow illustrate the changes that occur as the embryo develops into either a male or female.

Differential Development of External Genitalia





The major purpose of this diagram is to explain the events that occur in the formation of the male and female reproductive systems. You can see from the diagram that the external reproductive structures, the penis and clitoris as well as the scrotum and labium major, are derived from the same parts of the five-week embryo.

To gain a better understanding of the development of male and female reproductive organs, answer the following questions.

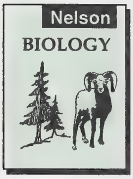
13. If you were to observe the fetus at various stages during its development, at what time could you determine its sex?

14. The development of male and female reproductive structures in the embryo is under the control of hormones. From what you learned, what hormone is responsible for these changes?

Check your answers by turning to the Appendix, Section 2: Activity 2.

Birth

Approximately forty weeks after the fertilization of the egg the fetus has all its body systems developed and most are ready to function. How does the fetus emerge from its protective womb? What triggers childbirth?



Read pages 423 and 424 and examine Figure 17.14 in your text. This sequence of diagrams illustrates the birth of a baby in a process called parturition. This process occurs in three stages.

The first stage is called labour. Labour involves contractions of the uterus which dilate the cervix and push the fetus downwards. These contractions start out weak but end very strong. Labour usually lasts twelve to eighteen hours.

The second stage is the delivery of the baby. Once the cervix has reached its maximum dilation, usually around 10 cm, the baby is pushed through the cervix and birth canal (second and third diagram in Figure 17.14) and leaves the mother's body. The delivery stage goes much quicker (minutes). The last stage is the expulsion of the placenta (afterbirth, fourth diagram in Figure 17.14). After the baby is expelled, continued contractions of the uterus are needed to remove the placenta. This also goes much quicker than labour (minutes) and usually occurs after the umbilical cord has been cut.

Answer the following questions.

15. For many women, the first sign that labour is beginning is that the woman's water breaks. What does this mean? Explain why this would be a sign that childbirth has begun.

16. State the source and function of the hormones relaxin and oxytocin.

17. One of the functions of progesterone is to inhibit the production of oxytocin during pregnancy. Why is the decrease in progesterone production thought to be the stimulus for childbirth?

Check your answers by turning to the Appendix, Section 2: Activity 2.

Lactation

Once the baby is born, its umbilical cord is cut, detaching it from its source of food, gas exchange, and waste removal. The newborn must now obtain nutrients, exchange gases, and eliminate wastes through its own systems. The body systems must quickly shift from a dependent fetus to an independent baby. The obtaining of nutrients is now accomplished through the mother's milk. The process of milk production is called lactation.

Nelson
BIOLOGY

To learn more about lactation, read the section titled Lactation on pages 424 to 425 of your text. When you have finished reading, answer the following questions.

18. Why do the breasts not produce milk if a woman hasn't recently given birth?

19. What is colostrum and what does it contain?

Milk release is stimulated by the production of oxytocin. Oxytocin production is stimulated by the sucking action of the baby on the mother's nipple. This is an example of one of the few positive feedback loops in the human body.

20. Construct a positive feedback loop to illustrate the mechanism of breast-feeding between the baby and its mother.

Check your answers by turning to the Appendix, Section 2: Activity 2.

Conception, implantation, development, and parturition – these processes describe the miraculous events that bring about the creation of a new human being from just two cells.

ACTIVITY

3 Fetal Disorders

In the past the miscarriage of a fetus or the birth of a defective baby was often blamed on the mother. Since the baby developed inside her body she was considered to be responsible for the health and condition of the baby at birth.

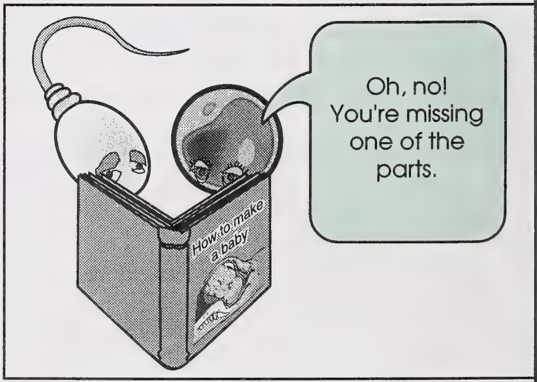
In this activity you will discover that the health and behaviour of the father prior to conception also plays a significant role in fetal development. You will also examine two other problems that can occur in the fetus as it develops.

Egg and Sperm Abnormalities

The chromosomes inside the sperm and egg cells carry the instructions needed to produce a new human being. If these chromosomes are changed in any way, the instructions could be altered, profoundly affecting the development of the embryo or fetus. Anything that can affect oogenesis in the ovaries or spermatogenesis in the testes could affect the chromosomes.

oogenesis – formation of egg or ovum

spermatogenesis – formation of sperm


Oh, no! You're missing one of the parts.
How to make a baby

To examine some new research about the condition of sperm cells and fetal disorders, read page 426 of your text. When you have finished reading, answer the following questions.

1. List three factors that could affect the chromosomes in sperm cells.
2. How could abnormal sperm cells affect the development of the fetus?
3. Using a reference of your choice (dictionary, encyclopedia, or some other reference), define the term *miscarriage*.

Check your answers by turning to the Appendix, Section 2: Activity 3.

Drug Abuse

Another source of fetal disorders is the use and abuse of drugs. One of the most abused drugs in society is alcohol. Alcohol consumed by a mother during pregnancy can affect the fetus. Nicotine from smoking or even breathing secondhand smoke is also strongly suspected as a cause of impeded fetal development.

Read the Social Issue on page 427 which presents the controversial issue of Fetal Alcohol Syndrome (FAS). Analyse this issue by answering the following questions.

4. What is the relationship between the statement "Women should refrain from drinking alcohol throughout their pregnancy" and FAS?
5. Write one other viewpoint for

   a. the point column   b. the counterpoint column

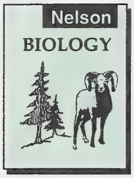
6. It is easy to see how alcohol abuse in the mother could lead to developmental problems in the fetus. How would alcohol abuse in the father lead to developmental problems in the fetus?
7. Why do doctors and dentists always ask women if they are pregnant before they write a prescription or begin treatment?
8. Predict the effect on a developing fetus that a drug causing reduced blood pressure or a slow heart rate in the mother would have.

Check your answers by turning to the Appendix, Section 2: Activity 3.

Blood Incompatibility

You should be able to recall from Biology 20 that humans have four major blood types and that some types mix with no problems, but if other types are mixed, serious problems result. Have you ever considered what would happen if the fetal blood is incompatible with its mother's blood, for example if the male parent and female parent have different blood types and a fetus inherits the male blood type? Is this possible? Would the fetus survive?

Most antibodies in the mother's blood are too large and cannot pass through the placenta to affect the blood of the fetus. However, antibodies for the Rh protein can pas through the placenta creating a serious problem. This problem, called erythroblastosis fetalis, was once a major concern to pregnant women having Rh negative blood. Technology, however, has played a major role in solving this problem.

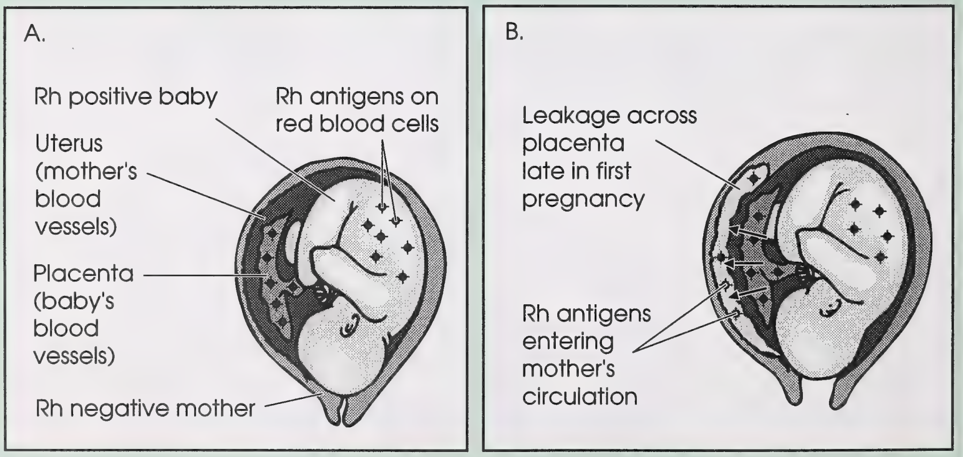


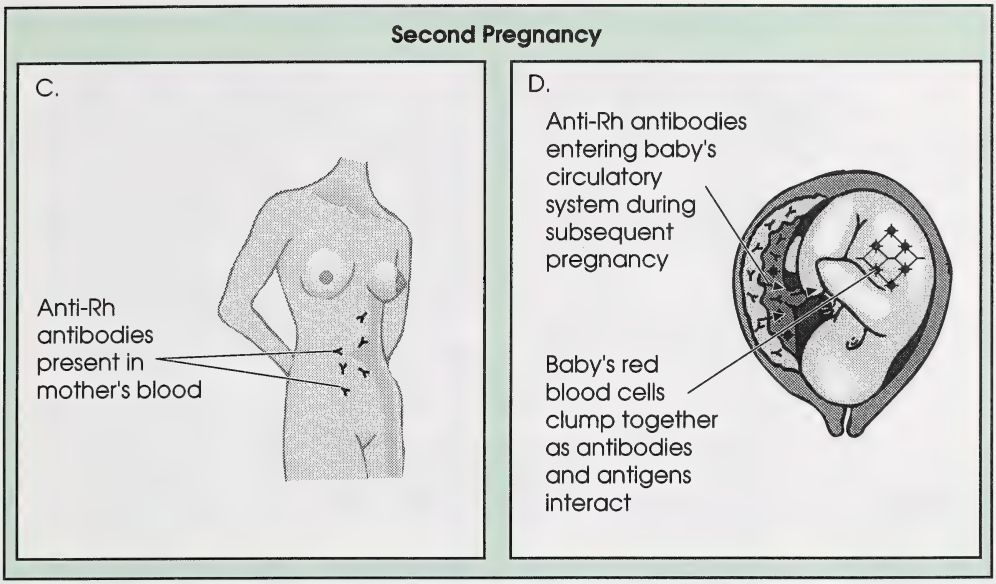
To find out more about this disorder, read the section titled Rhesus factor on pages 279 to 280 in the text.

Rh Factor and Incompatibility

Rh incompatibility can arise only when an Rh negative mother gives birth to an Rh positive baby (A). During birth (B), Rh antigens may leak into the mother's bloodstream, causing her to develop antibodies to the Rh factor (C). Then, the mother's antibodies will react with the Rh factors of the next Rh positive baby (D). If so, the result is erythroblastosis fetalis – destruction of the baby's red blood cells.

First Pregnancy


A.
Rh positive baby
Rh antigens on red blood cells
Uterus (mother's blood vessels)
Placenta (baby's blood vessels)
Rh negative mother
B.
Leakage across placenta late in first pregnancy
Rh antigens entering mother's circulation



Second Pregnancy

C.
Anti-Rh antibodies present in mother's blood
D.
Anti-Rh antibodies entering baby's circulatory system during subsequent pregnancy
Baby's red blood cells clump together as antibodies and antigens interact

9. Explain why erythroblastosis fetalis may affect a woman's second and third Rh$^+$ child but not her first.

10. List and describe two treatments that can be used for this disorder.

11. Does a woman with Rh$^+$ blood need to be concerned with this disorder? Explain your answer.

12. Predict the compatibility between the following mother and fetus situations.

Mother	Fetus	Compatibility
Rh$^-$	Rh$^+$	
Rh$^-$	Rh$^-$	
Rh$^+$	Rh$^+$	
Rh$^+$	Rh$^-$	

Check your answers by turning to the Appendix, Section 2: Activity 3.

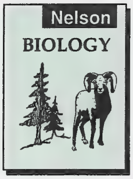
There are many factors, both genetic and environmental, that can affect the development of the fetus. You have learned a few in this activity. You will learn more in later modules on genetics. It is beneficial for you to be aware of these factors. They not only influence the life of any children you may have, but in doing so influence your life too.

Follow-up Activities

If you had difficulty understanding the concepts in the activities, it is recommended tha you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

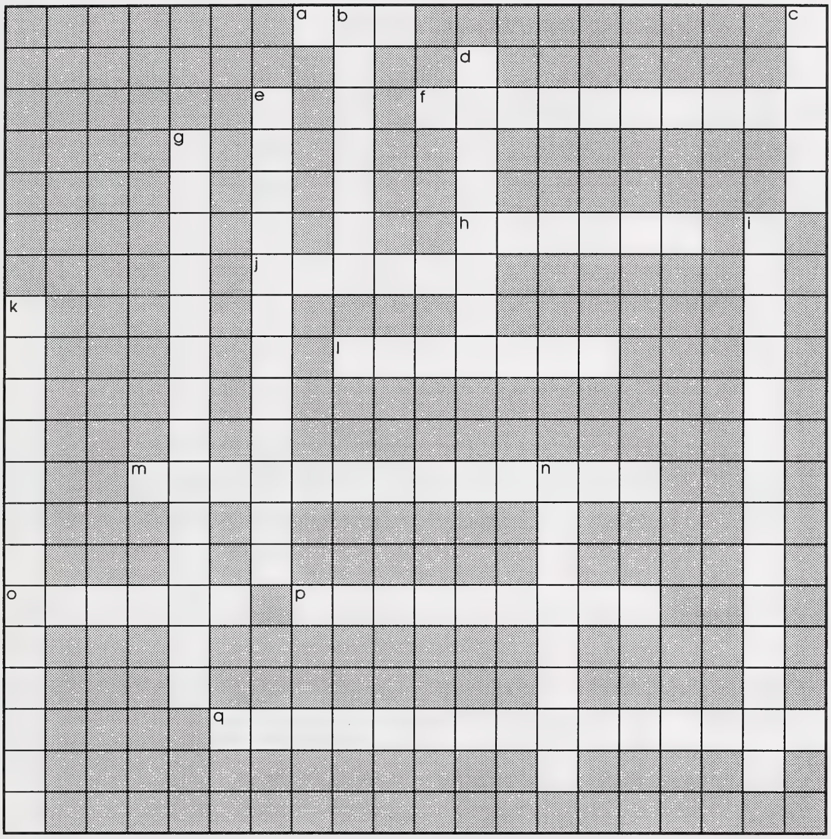
1. Use your text to find the differences between a gamete, a zygote, and an embryo.
2. What term describes the union of sperm and egg to form a zygote?
3. Describe the function of the placenta in terms of it being both a barrier and a passageway between the mother and the fetus.



4. Carefully read through the Chapter Highlights on page 427 and answer the following questions.
    a. What cells nourish developing sperm cells?
    b. Where are sperm cells stored after formation in the testes?
    c. Name five components of normal semen. You may have to look back in your text for this answer. What component is missing if a male has had a vasectomy?
    d. Describe two functions each for estrogen and progesterone.
5. Generally blood from the mother does not mix with blood in the fetus. How then could drugs that the mother takes still enter the fetus?

Check your answers by turning to the Appendix, Section 2: Extra Help.

6. Complete the following crossword as a review of terms.



Across

a. placental hormone that maintains the corpus luteum
f. early stage of embryo
h. early stages of an animal's development
j. fluid-filled embryonic membrane
l. hormone that causes the ligaments within the pelvis to loosen
m. connects the fetus to the placenta
o. cell union of the male and female sex cell
p. hormone associated with milk production
q. from the third month to the sixth month of pregnancy

Down

b. outer membrane of a developing embryo
c. embryo after the ninth week of development
d. site for exchange of nutrients and wastes between mother and fetus
e. attachment of the embryo to the endometrium
g. from conception until the third month of pregnancy
i. starting at the seventh or eighth month of pregnancy
k. the fusing of the male and female cell
n. hormone causes uterine contractions

Check your answers by turning to the Appendix, Section 2: Extra Help.

Enrichment

Do one or more of the following activities.

1. View the Living Body Series videos *A New Life* and *Into the World* or other current videos on fetal development and birth.
2. Research the viral disease rubella (German measles). Find out how this disease may affect the development of the fetus.
3. Locate the June 1992 *Discover* magazine in your local library. To learn of some new research into how fertilization occurs, read the article *The Aggressive Egg* on pages 60 to 65. To learn about another disorder, read *Turning a Man* on pages 70 to 77.
4. Do textbook question 4 on page 429 of your text.

Check your answers by turning to the Appendix, Section 2: Enrichment.

Conclusion

This section has introduced you to the remarkable events that occur from conception to childbirth. You have also learned of some potential problems that can affect the development of the embryo and fetus. In the next section you will learn about technologies that have an impact on reproduction.

40

Section 2 Assignment: Pregnancy and Fetal Development

Review the Evaluation information found in the introductory pages of this module.

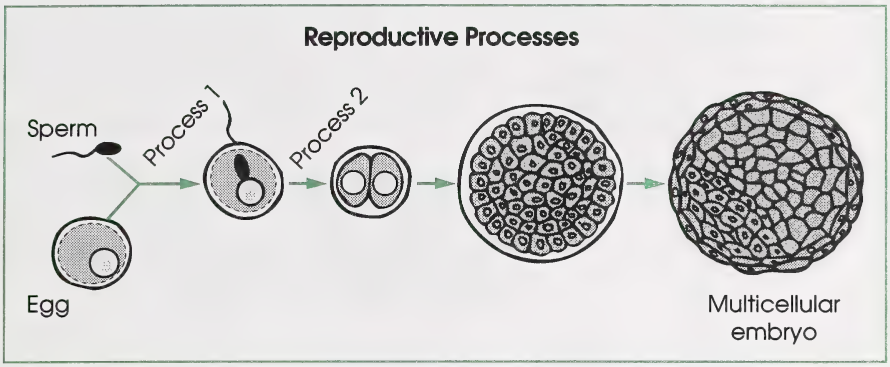
It is important to number and clearly identify each page with the following information at the top:

Biology 30 – Module 3 Section 2 Assignment Page # Name and ID#

Be sure to write legibly. Leave a wide left margin and number all of your pages.

Carefully read each of the following multiple choice questions and decide which of the choices **best** completes the statement or answers the question. Each question is worth 1 mark.

Use the following diagram to answer question 1.



1. Where do the processes labelled 1 and 2 normally occur?

   A. Process 1 occurs in an ovary and Process 2 occurs in a Fallopian tube.
   B. Process 1 occurs in a Fallopian tube and Process 2 occurs in an ovary.
   C. Processes 1 and 2 occur in a Fallopian tube.
   D. Processes 1 and 2 occur in the uterus.

2. After an embryo has been implanted in the uterine wall, there would likely be

   A. increased FSH production
   B. shedding of the uterine lining
   C. decreased progesterone production
   D. continued maintenance of the corpus luteum

3. An ectopic pregnancy is one in which an embryo implants in a place other than the uterus – most commonly in a Fallopian tube. This embryo does not mature because the lack of

   A. human chorionic gonadotropin secreted by the ovaries causes a miscarriage
   B. estrogen secreted by the placenta causes a miscarriage
   C. protection causes the embryo to die
   D. nutrients causes the embryo to die

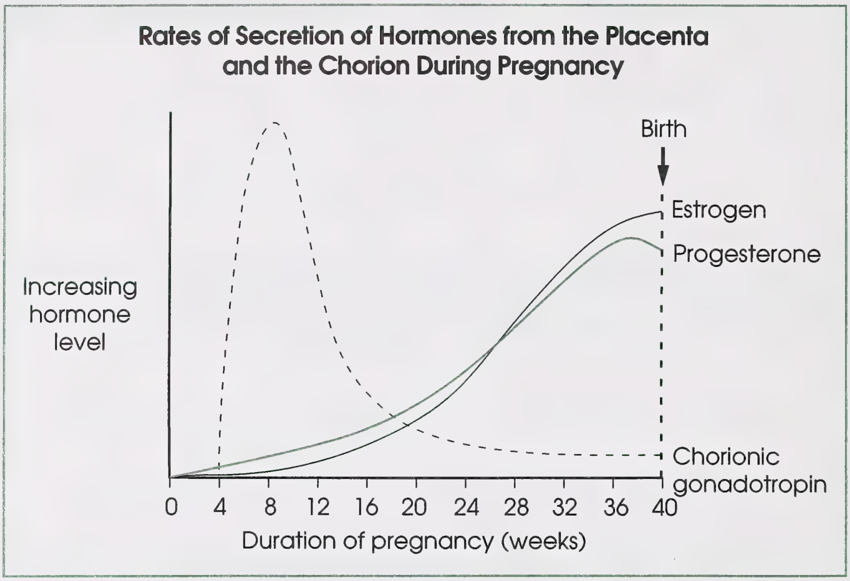
4. The zygote contains chromosomes from

   A. the mother only
   B. the father only
   C. both the mother and father, but half from each
   D. each parent and several new chromosomes of its own

5. Ovulation does not occur during pregnancy in the human female because

   A. the follicles are not influenced by the level of progesterone in the blood
   B. the corpus luteum and later the placenta produce large amounts of progesterone
   C. luteinizing hormone is no longer produced
   D. the embryo produces hormones which retard the production of FSH

Use the following graph to answer question 6.



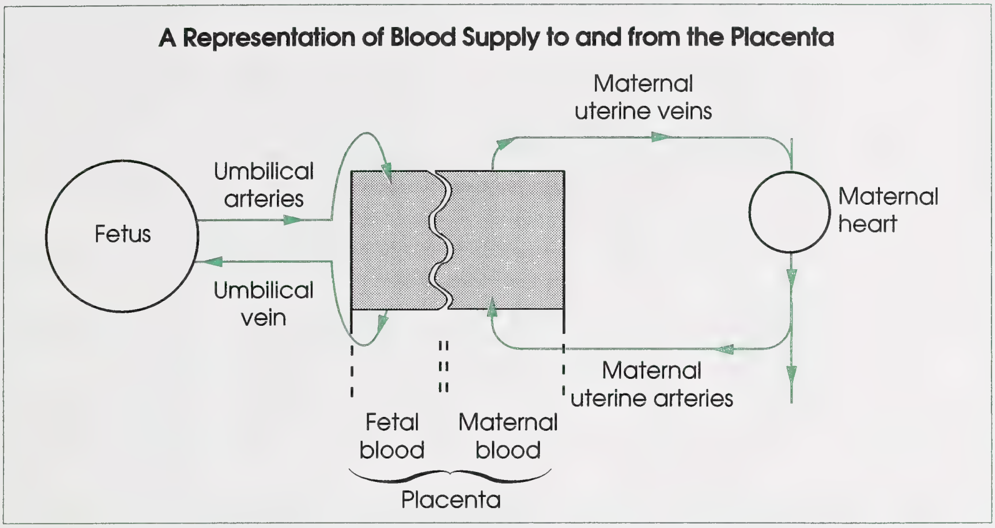
6. According to the graph, the placenta is least active and the chorion is most active in maintaining pregnancy during the time period from

   A. week 4 to week 12
   B. week 12 to week 20
   C. week 20 to week 28
   D. week 28 to week 32

7. The umbilical cord functions

   A. as a site of hormone and metabolic waste exchange
   B. as a site of hormone production and nutrient exchange
   C. to carry metabolic wastes from the developing fetus to the placenta
   D. to carry nutrients and gases from the developing fetus to the placenta

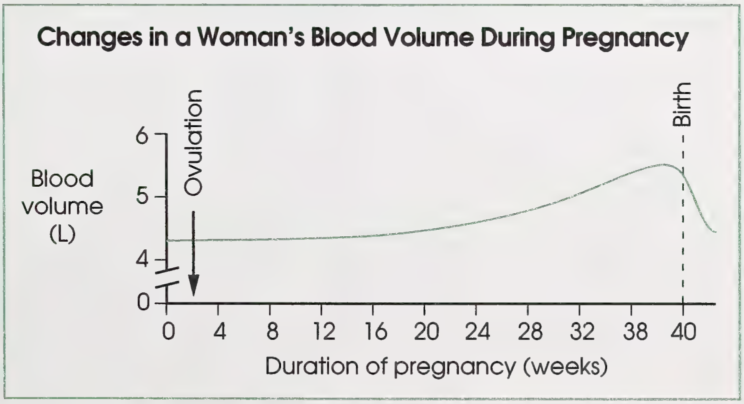
Use the following diagram to answer question 8.



8. Which row in the following chart identifies the relative level of **oxygen** in each of the four types of blood vessels?

Row	Blood Vessel			
	Umbilical Vein	**Umbilical Artery**	**Maternal Uterine Vein**	**Maternal Uterine Artery**
A	low	high	low	high
B	low	high	high	low
C	high	low	high	low
D	high	low	low	high

Use the following graph to answer question 9.

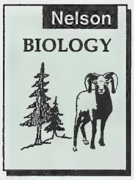


9. Which condition in the fetus is **not** a result of these changes in the woman's blood volume during pregnancy?

   A. Increased nutritional demands by the fetus are met by the woman's increased blood volume.
   B. Increased respirational demands by the fetus are met by the woman's increased blood volume.
   C. Increased exposure of the fetal blood to the woman's blood helps to develop the blood type of the fetus.
   D. Increased blood volume in the woman provides for the removal of additional metabolic wastes from the fetus.

10. When normal labour contractions are insufficient to cause birth, which hormone can be given to a woman to increase her uterine contractions?

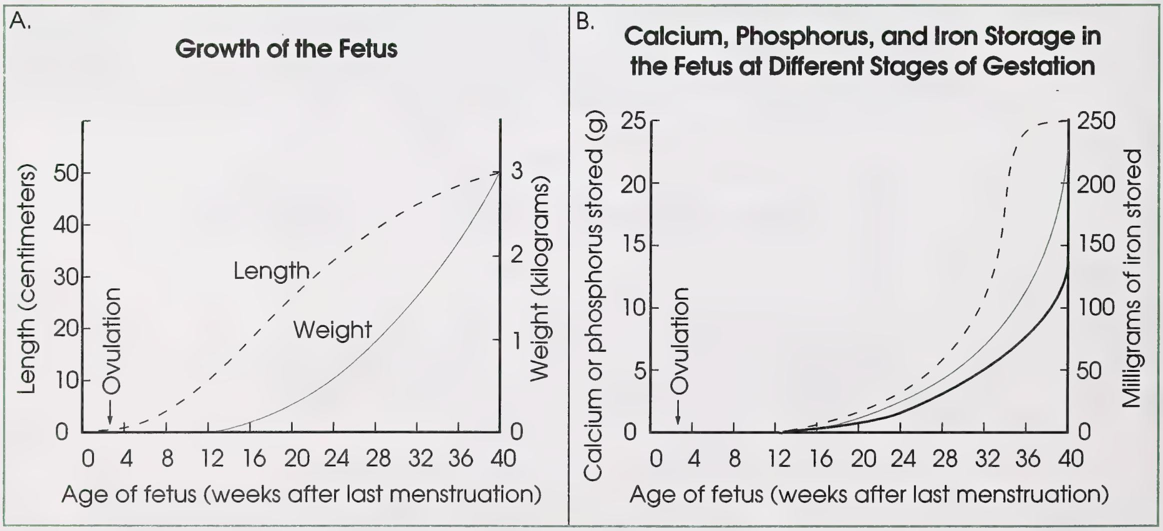
    A. relaxin
    B. oxytocin
    C. progesterone
    D. follicle-stimulating hormone



11. The placenta is a marvelous but temporary organ. Starting with a description of its formation, show how it is a functional part of both fetal and maternal anatomy and physiology during development of the fetus. **(6 marks)**

12. Do question 4 in Applying the Concepts on page 428 of your text. **(4 marks)**

These two graphs illustrate growth aspects of a fetus.
Use these graphs to answer question 13.



13. a. Identify the manipulated variable for each graph. **(1 mark)**

    b. Identify two responding variables in Graph B. **(2 marks)**

    c. Name two controlled variables common to both graphs. **(2 marks)**

    d. Explain why weight in Graph A starts to increase more dramatically after sixteen weeks. (Graph B can give you a clue.) **(1 mark)**

    e. Why do both graphs stop at forty weeks? **(1 mark)**

    f. Draw a graph similar to Graph A that would illustrate the growth of a fetus in a mother that is malnourished. Use weight versus age of fetus. **(3 marks)**

Science Skills

☐ A. Initiating
☐ B. Collecting
☐ C. Organizing
☐ D. Analysing
☑ E. Synthesizing
☐ F. Evaluating

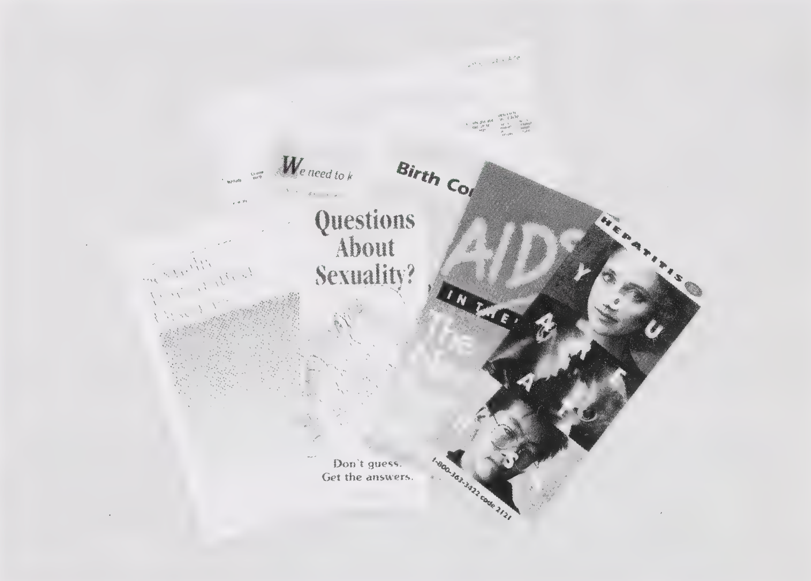
Reproduce the science skills assessment box after your response to this question. Remember to indicate your evaluation of your skill level for each identified science skill. Be sure to include the spaces for teacher assessment.

Self: A.	☐	B.	☐	C.	☐	D.	☐	E.	☐	F.	☐
Teacher: A.	☐	B.	☐	C.	☐	D.	☐	E.	☐	F.	☐

14. Starting from conception and ending with lactation, describe the major events that occur in the development of a fetus. In your description include an explanation of three factors that could affect the development of the fetus during this time. **(10 marks)**

SECTION

3 Reproductive Technology



You will have to make many difficult choices in your life. Should you use birth control? Should you have your fetus tested to determine if it is healthy? What should you do if your fetus has a deformity? If you are unable to conceive a baby naturally, should you use new reproductive technologies available? The more informed you are, the more assured you will feel about making the best decision.

In this section you will gain a better understanding of some reproductive technologies, what they can and can't do for you, and the advantages and disadvantages of their use. You will examine how these technologies impact society, as well as some of society's expectations and values about reproductive issues.

ACTIVITY

1 Types of Technology

When asked what a reproductive technology is, people may reply that it is birth control. They may describe such technologies as ultrasound, amniocentesis, or frozen embryos. These four examples reflect the wide range of ideas that people have about reproductive technology. You will learn more about current reproductive technologies in this activity.

Birth Control

Most methods of birth control prevent pregnancy by preventing fertilization of an egg. This is also called contraception. A summary of the most commonly used methods is found in the following table.

It is important to keep in mind when you read this table that the failure rate is represented as an average. Failure of a method to prevent conception could occur at any time over the course of its use.

Examine the table and answer the questions which follow.

Birth Control Table

Method	User Effectiveness	How It Works	Advantages	Disadvantages
Abstinence: Individual refrains from having sexual intercourse.	100%	no sperm ever enter uterus or cervix	free, no side effects, complete effectiveness	pleasure of sexual intercourse not enjoyed
Tubal ligation: Fallopian tubes are cut and tied off.	99.9%	prevents egg from uniting with sperm, eggs do not reach uterus	very effective, no motivation required	medical procedure, irreversible
Vasectomy: A section of vas deferens is cut and removed; remaining ends are tied off.	99.9%	prevents sperm from being ejaculated in semen	very effective, no motivation required	medical procedure, seldom reversed
Oral contraceptives: A pill containing estrogen and progesterone is taken daily.	90 – 96%	prevents ovulation or prevents implantation of fertilized egg	high effectiveness, easy to use – little hassle	possible side effects, motivation required for effectiveness
I.U.D.: An intrauterine device of plastic and metal is inserted into uterus.	95%	prevents implantation of fertilized egg (probably)	high effectiveness, no special upkeep after insertion	possible side effects, may slip out, medical insertion and removal required

[1]

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[1] Adapted from *Family Planning and Sexuality Programme Handbook*, 1986. Toronto.

Birth Control Table

Method	User Effectiveness	How It Works	Advantages	Disadvantages
Condom: A latex rubber sheath is worn over the penis.	90%	prevents sperm from being deposited in vagina	available without prescription, inexpensive, no side effects	may leak or burst, may interfere with pleasure of intercourse
Diaphragm (with spermicide): A rubber dome fits over cervix; spermicide kills sperm.	83%	provides barrier and kills sperm at cervix	no side effects	medical fitting required, motivation required for effectiveness
Spermicidal foam: The foam is placed in the vagina prior to intercourse.	78%	kills sperm	available without prescription, inexpensive, no side effects	messy, inconvenient, may cause an allergic reaction in some users
Withdrawal: The penis is withdrawn before ejaculation.	75%	prevents sperm from being deposited in the vagina	free	ineffective, may interfere with pleasure of intercourse
Rhythm (also known as Fertility Awareness or Natural Family Planning): Intercourse is avoided during fertile period.	75%	limits intercourse to infertile part of cycle	free, approved by some religious groups	ineffective, requires abstinence or other method as well, difficult if cycles are irregular
Douche: The vagina is flushed with water or a chemical solution after intercourse.	60%	doesn't	none	non-method, sperm may enter cervix seconds after ejaculation

[1]

Natural methods of birth control depend on the behaviour of the couple and are not considered reproductive technologies.

1. Identify three natural methods of birth control described in the table.
2. In a vasectomy both vas deferens are cut and tied off. Would a man who has had a vasectomy still be able to do the following? Explain your answers.
    a. produce semen
    b. have sexual intercourse
3. Which of the methods involve
    a. surgery
    b. the use of hormones
    c. a barrier to sperm
4. Which of the methods are used by
    a. females
    b. males
    c. both males and females

---

[1] Adapted from *Family Planning and Sexuality Programme Handbook*, 1986. Toronto.

5. a. Which methods are most effective?

   b. Which methods are the least effective?

6. One method on this table is not a form of contraception, but blocks implantation instead. Which method is this?

Check your answers by turning to the Appendix, Section 3: Activity 1.

Ultrasound Imaging

Nelson
BIOLOGY

Look at Figure 19.12 on page 458 of your text. This is a picture of ultrasound being used to produce an image of a fetus. Ultrasound imaging uses sound waves to form an image of the fetus on a television screen. Notice on the left TV screen the foot of the fetus is visible, and on the right TV screen the head of the baby appears as a round circle.

To learn more about ultrasound, read the first two sentences under Frontiers of Technology on page 458. Then answer the next question.

7. What information about the fetus can ultrasound be used to detect?

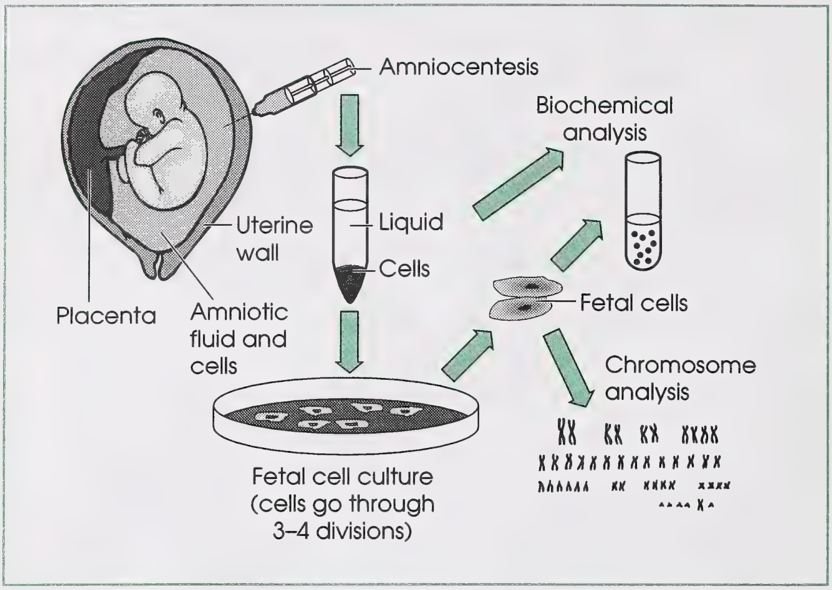
Check your answers by turning to the Appendix, Section 3: Activity 1.

Amniocentesis

Nelson
BIOLOGY

Another reproductive technique is amniocentesis. Complete the reading of the first paragraph on page 458 to learn more about this technology. When you have finished reading, answer the following questions.

The following diagram illustrates the amniocentesis procedure and the analysis of the fluid withdrawn from the womb.



8. Describe the composition of the fluid withdrawn from the amniotic sac.

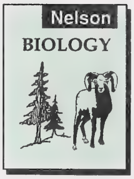
9. List the three tests that can be performed on the fluid withdrawn from the womb by amniocentesis.

10. Compare amniocentesis with ultrasound by testing the similarities and differences.

Check your answers by turning to the Appendix, Section 3: Activity 1.

In Vitro Fertilization

Fertilization occurs when a sperm penetrates an egg. This may occur inside or outside the body. What does in vitro fertilization mean?



To find the answer to this question and to discover more about this technology, read the section titled Frontiers of Technology: In Vitro Fertilization on page 425 of your text. When you have finished reading, answer the following questions.

11. What does *in vitro* mean?

12. Describe the steps involved to perform an in vitro fertilization.

13. Why is the term *test-tube baby* not an accurate description of in vitro fertilization?

Check your answers by turning to the Appendix, Section 3: Activity 1.

The four technologies you have studied in this activity represent some scientific technologies used to affect reproduction. What are these affects? What implications could these technologies have on your life and on human life? You will examine these questions in the next activity.

ACTIVITY

2 Impact on Society

Every choice you make will have implications, big or small, on someone or something. If you choose one path, does that eliminate another path? Can you go back? What are the advantages of going one way instead of another? Are these disadvantages?

Your decision on whether to use available reproductive technologies will have important implications.

To evaluate the implications of the reproductive technologies you examined in Activity 1, answer the following questions.

1. Complete a table about reproductive technologies using the following headings. Refer to Activity 1 and your text for help.

Reproductive Technology	Implications for Human Life	
	Advantages	Disadvantages
Amniocentesis		
Ultrasound		
In vitro Fertilization		

Nelson
BIOLOGY

2. Do Textbook question 3 on page 429 of your text.

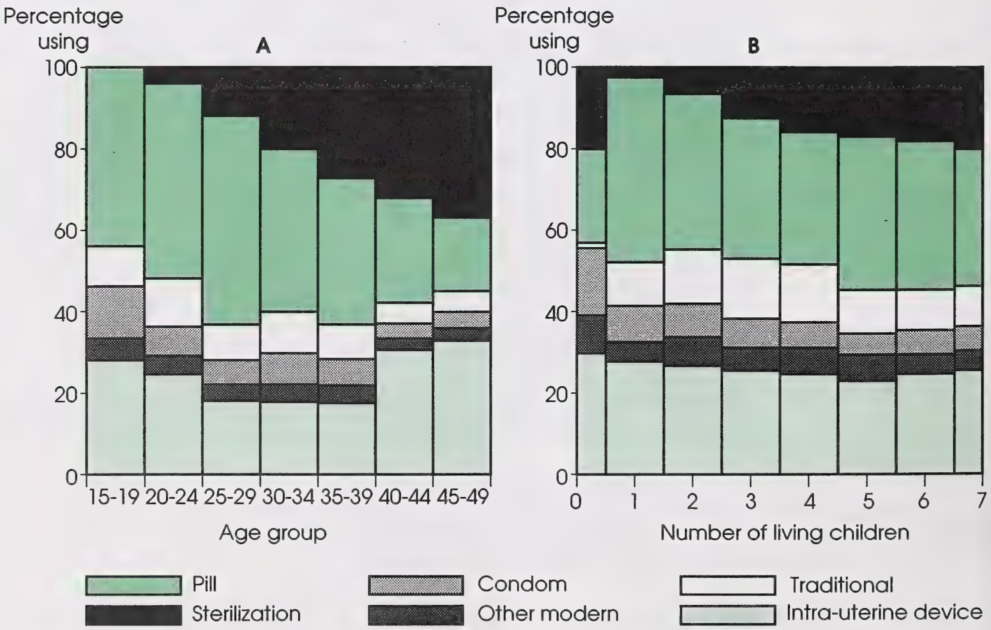
Check your answers by turning to the Appendix, Section 3: Activity 2.

The use of various forms of birth control is widespread among different age groups and countries across the world. To assess the effect birth control technology has on populations, examine the following information; then answer the questions.

Science Skills

☐ A. Initiating
☐ B. Collecting
☐ C. Organizing
☑ D. Analysing
☐ E. Synthesizing
☐ F. Evaluating

Contraceptive Methods[1]



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[1] Current use of specific contraceptive methods, by age group and number of living children: average distributions for 38 countries from United Nations (1987). *Report on Fertility Behavior in the Context of Development.*

3. Describe the trend seen in graphs A and B regarding the use of sterilization. Explain the probable reason for this trend.

4. What pattern exists with the use of oral contraceptives? Explain your answer.

5. Predict the effect birth control may be having on the populations of the thirty-eight countries used in this study.

Check your answers by turning to the Appendix, Section 3: Activity 2.

You should now be more familiar with reproductive technologies. A good understanding of this concept, however, often leads to moral dilemmas. You will explore some dilemmas in the next activity.

ACTIVITY

3 Values and Expectations

The decision you make is not necessarily the decision someone else will make. You may choose to go to one movie while your friend chooses to go to a different movie. You may choose root beer while your friend chooses orange soda. In many cases your choice is based on a knowledge or expectation of usefulness, merit, desirability, or superiority of one choice over another. Some people feel very strongly about choices made by society.

Nelson BIOLOGY

To examine some of society's expectations of the scientific community with respect to reproductive technology, read the section entitled Redefining Motherhood on page 462 of your text. When you are finished reading, answer the following questions.

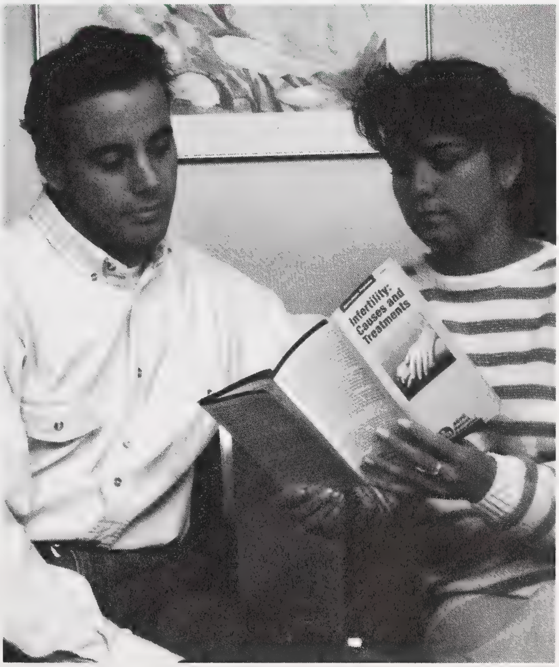


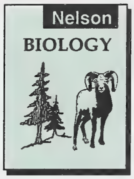
PHOTO SEARCH LTD.

1. What is a surrogate mother?

2. Give at least one argument for and one against the use of surrogate wombs and in vitro fertilization.

3. Should society expect the scientific community to be able to solve medical problems like infertility? Provide reasons to support your answer.

Check your answers by turning to the Appendix, Section 3: Activity 3.



As you can see, these technologies can create controversy and lead to difficult choices. Now turn to page 464 of your text. Read the section titled Social Issue: Limits on Reproductive Technology. When you are finished reading, answer the following questions.

4. Add at least one more point and counterpoint to this issue.

5. If the statement was changed to read, "The limits to reproductive technology should be set by scientists," how would you argue for and against it? Develop one point and one counterpoint.

Check your answers by turning to the Appendix, Section 3: Activity 3.

In order for you to make a decision, you need a clear understanding of what it is you are making a decision about. Generally the more informed you are, the better your decision will be.

Follow-up Activities

If you had difficulty understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

1. Match the name of the reproductive technology to its description.

   - birth control
   - ultrasound
   - amniocentesis
   - in vitro fertilization

   a. ______ analyses a sample of amniotic fluid from the womb

   b. ______ when fertilization occurs outside of the female's body

c. _______ tests for genetic defects in a fetus or embryo

d. _______ used to prevent conception

e. _______ can be used to locate the position of the fetus in the womb

f. _______ has two forms: natural and artificial

g. _______ can provide an image of the fetus inside the womb

h. _______ incorrectly named "test-tube baby"

2. Define the following terms:

   a. contraception b. ultrasound c. amniocentesis d. in vitro fertilization

3. Evaluate artificial and natural methods of birth control by constructing a table of advantages and disadvantages of each method.

4. Make a list of some of the implications the reproductive technologies studied in Activity 1 have had on human life. Compare ultrasound, amniocentesis, in vitro fertilization, and birth control. This can be done in chart form.

Check your answers by turning to the Appendix, Section 3: Extra Help.

Enrichment

Do one or more of the following.

1. a. Watch the video *Prenatal Diagnosis: To Be or Not To Be* by the *Nature of Things*, CBC to increase your knowledge of reproductive technology.

   b. Watch the video *Who Should Decide*, the second program in *Discussions in Bioethics* by the National Film Board of Canada to increase your appreciation for ethical dilemmas in reproduction.

2. Visit a local health clinic, library, or other resource and find out about chorionic villus sampling and other technologies developed to study the developing fetus.

3. Research how advances in knowledge of fetal development over the past forty years have affected society's value of life.

4. Answer the following questionnaire.

Birth Control Questionnaire			
	Yes	No	Don't Know
a. Abstinence (no sexual intercourse) is the only method of birth control that is 100% effective.			
b. A female cannot get pregnant until she has her first menstrual period.			
c. Condoms usually give protection against sexually transmitted diseases.			
d. A female cannot get pregnant if she has sex during her period.			
e. A female could have sex on Tuesday and get pregnant on Friday.			
f. A pregnancy test is accurate as soon as a female misses her period.			
g. There are times in the month that a male is not fertile.			
h. A female can get pregnant the first time she has sex.			
i. The pill helps to prevent sexually transmitted diseases.			
j. Withdrawal (pulling out) is a good method of birth control.			
k. A female can get pregnant without full intercourse taking place.			
l. The correct way to use a condom is to put it on just before ejaculation.			
m. Foam and condoms used together are a good method of birth control.			
n. Anyone can phone the Birth Control Centre of their local Board of Health for confidential information.			

[1]

Check your answers by turning to the Appendix, Section 3: Enrichment.

Conclusion

Now you have more knowledge of reproductive technology and some of the consequences that surround decisions about their use. This information may not make a decision easier, but it presents options and understanding where before there may have been none. The decision is yours.

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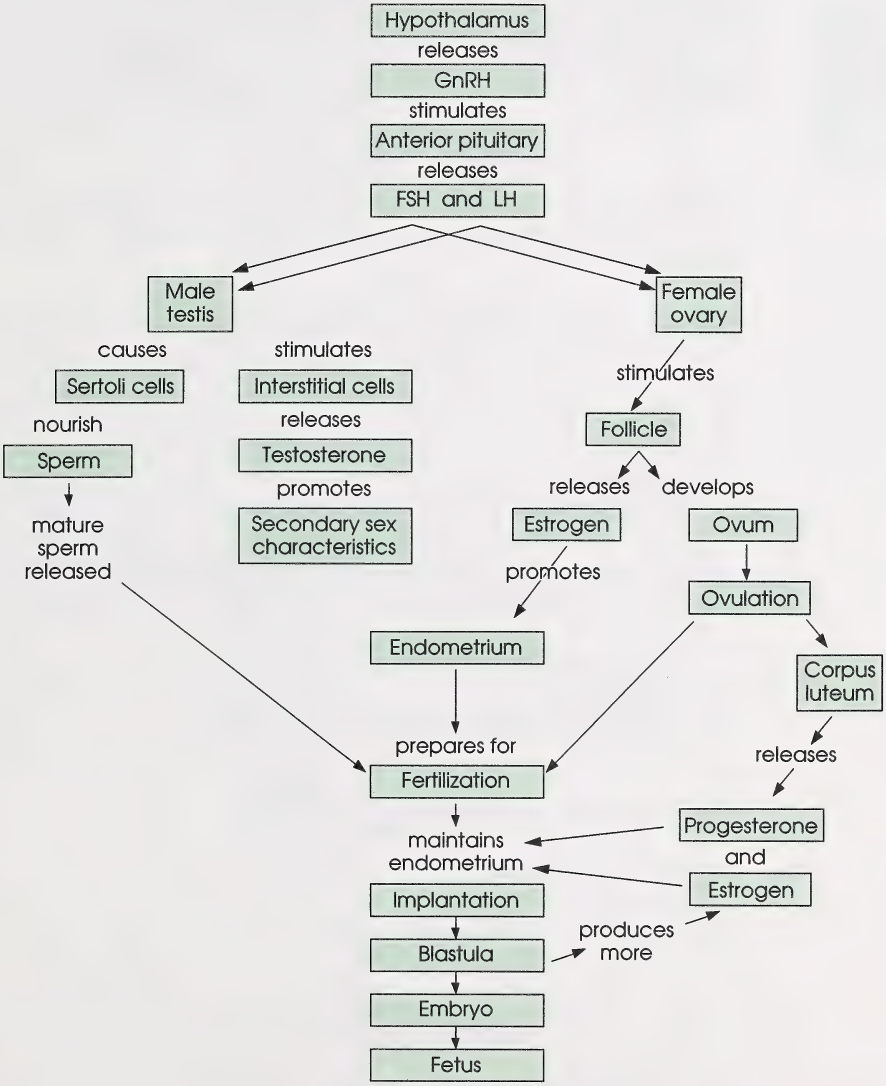
[1] Adapted from Edmonton Board of Health.

Read over this graphic summary of Module 3. You should be able to recognize all of the terms in the boxes and understand the connecting words.



30

Section 3 Assignment: Reproductive Technology

Review the Evaluation information found in the introductory pages of this module.

Response Page Setup

It is important to number and clearly identify each page with the following information at the top:

Biology 30 – Module 3 Section 3 Assignment Page # Name and ID#

Be sure to write legibly. Leave a wide left margin and number all of your pages.

Carefully read each of the following multiple choice questions and decide which of the choices **best** completes the statement or answers the question. Each question is worth 1 mark.

1. Which of the following has proven to be the most effective method of birth control so far?

   A. withdrawal
   B. the pill
   C. condoms
   D. rhythm method

2. To be effective, the rhythm or natural method of birth control must include abstinence during the cycle from

   A. day 4 to day 12
   B. day 16 to day 20
   C. day 12 to day 18
   D. day 14 only

3. Birth control pills are effective because they

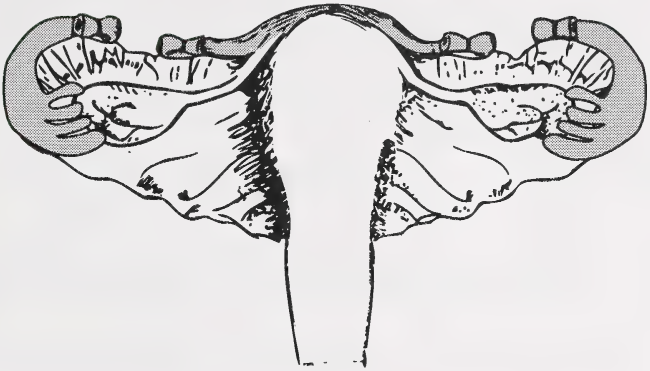
   A. prevent ovulation
   B. kill sperm cells on contact
   C. stop growth of the endometrium
   D. prevent implantation

4. Which of the following is true about a vasectomy?

   A. It lowers the production of testosterone.
   B. It decreases the sperm count slightly.
   C. It prevents sperm from leaving the testes.
   D. It eliminates the ejaculation process.

Use the following information to answer question 5.

Representation of a Tubal Ligation*



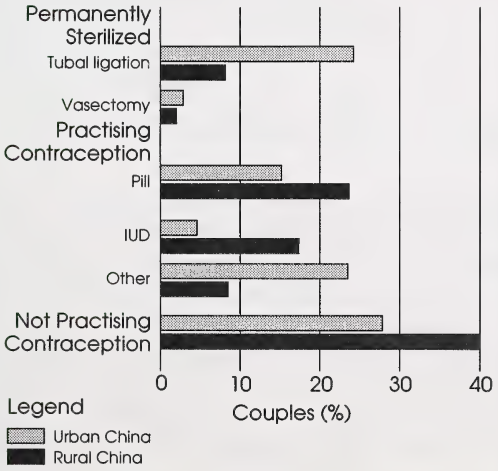
* a surgical procedure that involves cutting, tying back, and sealing the Fallopian tubes

5. As a result of a tubal ligation,

A. eggs will no longer be released into the Fallopian tubes
B. fertilization will occur but implantation is prevented
C. eggs will no longer reach the uterus
D. menstruation will not occur

Use the following table to answer question 6.

Use of Birth Control in China in the 1970s



6. a. Identify two manipulated variables. **(2 marks)**

   b. Identify the responding variable. **(1 mark)**

Science Skills

☐ A. Initiating
☐ B. Collecting
☐ C. Organizing
☑ D. Analysing
☑ E. Synthesizing
☑ F. Evaluating

   c. List two controlled variables that should have been used for this study. **(2 marks)**

   d. For which method was there the greatest discrepancy between rural and urban use? **(1 mark)**

   e. Suggest a reason for your answer in d. **(1 mark)**

   f. Assuming birth control is a major factor influencing birth rates, predict what the relative birth rates for rural versus urban areas would be. **(1 mark)**

   g. Why would the percentage of couples not practising contraception be much higher in rural than urban China? **(2 marks)**

Reproduce the science skills assessment box after your response to this question. Remember to indicate your evaluation of your skill level for each identified science skill. Be sure to include the spaces for teacher assessment.

Self:	A.	☐	B.	☐	C.	☐	D.	☐	E.	☐	F.	☐
Teacher:	A.	☐	B.	☐	C.	☐	D.	☐	E.	☐	F.	☐

7. Explain how the hormones of the hypothalamus, pituitary, ovary, and blastocyst regulate development of the endometrium and placenta. Construct a table that shows the appearance of these hormones in the blood as puberty, oogenesis, ovulation, and implantation occur. (**15 marks**; 10 marks for information, 3 for table, and 2 for communication)

MODULE SUMMARY

From your study of human systems in Biology 20 and Modules 1 and 2 in Biology 30, you may appreciate that life is quite a complex process. Think of the systems required for digestion, excretion, circulation, and communication. Now you have learned about another system – reproduction. After studying the male and female reproductive systems and fertilization and development, you may feel that like all living systems, reproduction is complicated too. But do you realize that reproduction has nothing to do with staying alive? That is right. Digestion, circulation, excretion, and communication are all required to support your day-to-day life, but reproduction is only required to ensure the survival of your species. Reproduction is necessary to perpetuate life on Earth.

To ensure that all of your work has been completed in a satisfactory manner, check off the items in the following list:

- ☐ Section 1 Assignment has been completed.
- ☐ Section 2 Assignment has been completed.
- ☐ Section 3 Assignment has been completed.
- ☐ Your responses are organized and neat, with room for teacher comments.
- ☐ All your response pages are numbered consecutively and identified with this heading.

Biology 30 – Module 3 Section # Assignment Page # Name and ID #

Appendix

Glossary

Suggested Answers

Glossary

blastocyst: a hollow ball of cells formed by the developing embryo

extraembryonic: cells forming membranes around the embryo

oogenesis: formation of egg or ovum

spermatogenesis: formation of sperm

Suggested Answers

Section 1: Activity 1

1. Body temperature is too high for sperm development. With the testes outside the body, the temperature is a few degrees cooler, optimum for sperm cell development.

2. Tight jeans hold the testes closer to the body, increasing the temperature inside the scrotum. This increase in temperature prevents sperm cells from growing; therefore, the male will not have properly developed sperm cells. Another effect can be a reduction in sperm numbers or an increase in abnormal sperm.

3. Other situations could include working in high temperatures as in welding shops, prolonged sitting as in truck driving, or even sitting in a hot tub too long (a very long period of time – hours). Some evidence suggests breathing harmful substances like solvents could also affect sperm production.

4.
    a. bladder
    b. front of pelvis or pubic symphysis
    c. urethra
    d. penis
    e. scrotum
    f. vas deferens
    g. seminal vesicle
    h. prostate gland
    i. Cowper's gland
    j. epididymis
    k. testis

5.
    a. the sac that contains the testes

    b. the structures in the male that produce sperm cells and testosterone

    c. tubes that conduct sperm toward the urethra

    d. coiled tubes within the testes that produce sperm cells

    e. where sperm cells finish their development and are stored

    f. produce a sugar (fructose) solution and prostaglandins that are added to sperm cells to produce semen

    g. produces a fluid that contains a buffer to protect sperm cells which is added to sperm cells to form semen The buffer protects sperm cells from the acidic environment of the vagina.

    h. produces a mucus fluid, which is believed to aid in sperm movement and protects sperm cells from acids associated with the passage of urine through the urethra

    i. a channel through the penis that carries urine, sperm, and semen

    j. cells found inside the seminiferous tubules that nourish the sperm cells

6. Semen refers to the solution prepared by the male reproductive system that contains sperm cells and fluids from the seminal vesicle, the prostate gland, and Cowper's gland.

7. a. provides movement
   Sperm swim towards the ovum.

   b. produces energy for the tail movements
   The middle piece contains mitochondria.

   c. carries acrosome and nucleus

   d. contains enzymes that dissolve the outer coat of the egg allowing the sperm cell to penetrate the gelatinous layers surrounding the egg

   e. carries one half of the required genetic material to form a new individual

8. seminiferous tubule → epididymus → vas deferens → ejaculatory duct → urethra

9. a. The castration of young boys prevented the later development of testosterone in their bodies from influencing the muscles of the voicebox; thus, their voices remained unchanged.

   b. Once they reached their mid-teens, these boys would not develop additional facial and body hair or the accelerated development of muscles that occur in normal teenage boys. They would also be sterile.

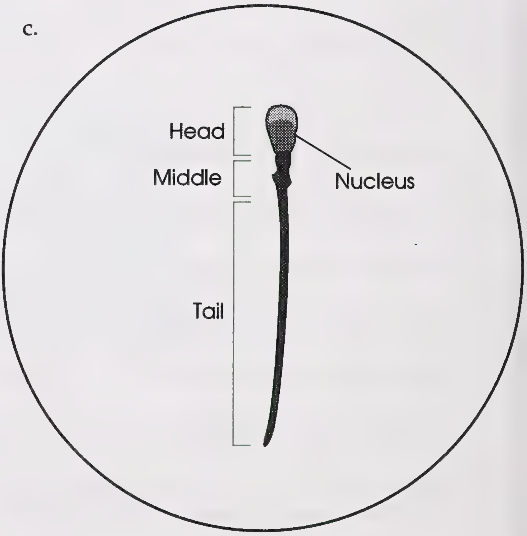
10. The sperm could not swim as well towards an ovum. Chances of fertilization would be reduced.

11. a. • The sperm have a long, thin tail; a thickened middle piece; and a head. The nucleus and acrosome are visible in the head.

    b. • About twenty sperm heads would span the field of view side by side so their size is about 0.006 mm.

$$\frac{1}{20} \times 0.12 \text{ mm} = 0.006 \text{ mm}$$

    c.



12. a. Approximately 170 would span 1 mm side by side.

    b. Approximately 1 700 would span 1 cm side by side.

13. Sperm refers to the individual cell, produced in the seminiferous tubule. Sperm contain the chromosomes. Semen refers to the solution produced by the male reproductive system that includes sperm cells and fluids from the accessory glands (prostate, Cowper's gland, and seminal vesicles). The fluids assist the sperm in reaching an ovum.

Section 1: Activity 2

1. The ovaries produce eggs and hormones that regulate the female reproductive system.

2. The ovaries are found inside the lower abdomen, whereas the testes are found outside the body in the groin area.

3. a. ovary
   b. Fallopian tube (oviduct)
   c. uterus
   d. bladder
   e. cervix
   f. urethra
   g. vagina
   h. pubic symphysis
   i. clitoris
   j. labium minor
   k. labium major

4. a. provides a passageway for delivery of the newborn and for menstrual flow
   It also receives the penis (and semen) during sexual intercourse.

   b. a muscular opening to the uterus that prevents the fetus from prematurely entering the birth canal

   c. the female reproductive organs that produce hormones and eggs

   d. the female organ in which the fertilized ovum normally becomes embedded and in which the embryo and fetus develop

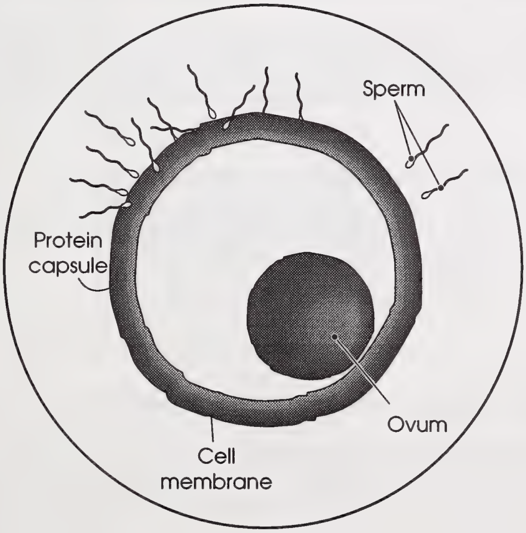
   e. the passageway through which the egg moves from an ovary to the uterus

5. When the egg and sperm unite, the chromosomes from both cells will combine. Consequently, each cell should only have half (twenty-three) of the chromosomes in order to make a new cell with forty-six. The reduction in chromosome number occurs during meiosis.

6. Under normal circumstances, a woman who has reached menopause can no longer become pregnant because she is no longer capable of producing eggs.

7. The drug in the fertility pills stimulates the ovary to develop and release more than one egg. Sufficient sperm may be present to fertilize several eggs.

8. a.



   b. Size: $\frac{1}{2} \times 1.1 = 0.65$ mm

9. From the observations through the microslide viewer, the only part that you can determine that is present on a sperm cell but not on the egg is the tail. The much greater mass of the egg cell is made up by cytoplasm.

10. The size of the egg cell insures its survival for at least twenty-four to forty-eight hours, once released from the ovary. The egg has no other fluids from which to draw nutrients to stay alive other than what it contains. Sperm cells are suspended in the semen, which contains nutrients and other substances that help keep sperm cells alive for up to five days. The small size of the sperm assists mobility.

11. Both egg and sperm cells contain a nucleus that has twenty-three chromosomes.

Section 1: Activity 3

1. An inguinal hernia results in a rupture of part of the abdominal wall. Lifting heavy objects or excessive bending increases the pressure inside the abdomen. If the pressure is too great or continues over long periods of time, the lower intestines are pushed downward and may protrude.

2. If the small intestine enters the scrotum it could increase temperatures inside the scrotum resulting in improper growth and development of sperm cells. Blood vessels around the testes could also be restricted by pressure from the intestine. Blockage of the intestine could occur by constriction.

3.

Type of Cancer	Gender Affected	Age of Most Common Occurrence	What to Look for in a Regular Examination
breast	female*	35 and over	lumps in breasts
cervical	female	30-50	cannot be detected by self-examination
prostate	male	increases with age; most common in 50 and older	difficult or painful urination
testicular	male	any age	lumps in testes/scrotum

*Breast cancer is also known to occur in males.

4. Testicular cancer could cause abnormal sperm production or it could stop it altogether. Prostate cancer could cause inadequate semen. The longevity of the sperm cells when in the female reproductive system would be reduced thus decreasing the chance of fertilization. Prostate cancer is often fatal, especially if not treated.

5. If the cervical cancer is detected early, it can be treated and the woman may still be able to have children. If not, usually the uterus is surgically removed in an operation called a hysterectomy. Without the uterus, the woman cannot have children. With breast cancer, if it does not spread to the rest of her body and is treated, a woman can still have children. Unfortunately if untreated, breast cancer is usually fatal.

Section 1: Activity 4

1. Viruses, bacteria, yeasts, and protozoans are the most common organisms which cause STDs.

2. Warmth, darkness, and moisture are needed for the growth of STD organisms.

3. The genital organs and area provide all three conditions needed for growth.

4. Gonorrhea infects the urethra in males and the urethra, vagina, and cervix in females.

5. Symptoms are more common in males. Up to 20% of males will not show symptoms, but up to 80% of females may be asymptomatic.

6. Without symptoms, a female may not seek treatment. Untreated gonorrhea can invade the Fallopian tubes and ovaries resulting in pelvic inflammatory disease (PID). Scarring and blockage of the Fallopian tubes may result in sterility or tubal pregnancy (implantation of embryo in Fallopian tube).

7. Gonorrhea may infect the eyes of a newborn during birth and cause blindness. Special drops are usually placed in a newborn's eyes just after birth to prevent gonorrhea.

8. Reinfection is prevented by treating both sex partners at the same time.

9. In males chlamydia affects the urethra and results in a burning sensation and mucus-like discharge during urination. It may also affect the prostate gland and testis.

10. Babies born to chlamydia-infected females may have an increased risk of eye and lung problems.

11. Different antibiotics are used to treat each disease.

12. Syphilis is a very serious STD because it is highly contagious and has serious long-term consequences.

13. Stage 1 involves a sore called a chancre at the site of infection. Stage 2 involves a skin rash that breaks out anywhere on the body. It may appear as little bumps on the hands and feet or red patches on the skin. Stage 3 occurs years later when the syphilis organisms invade and disrupt vital organs. It may invade the eyes, brain, or heart.

14. During pregnancy syphilis may infect the fetus. Premature birth, miscarriage, stillbirth, and congenital deformities may result.

15. Early detection and treatment reduces the chances of spreading infection and of serious complications developing.

16. Vaginitis may be caused by a yeast, a bacterium, or a microscopic protozoan called *Trichomonas*.

17. Herpes is caused by a virus, *Herpes simplex*. The virus survives in the nervous system.

18. The symptoms of herpes infections, sores or fever blisters, last two to four weeks and can be treated with medications that reduce discomfort and speed healing. However, treatment is not a cure as the symptoms may occur again from the herpes virus living in the body. There is no cure.

19. In women, genital herpes may lead to cervical cancer.

20. The AIDS virus invades the immune system.

21. The AIDS virus can be carried in blood, semen, vaginal secretions, and breast milk.

22. Casual contact describes touching such as hugging or shaking hands, sharing bathroom facilities, or sharing objects such as telephones or clothing. Sexual intercourse and sharing needles during drug use are not considered to be casual contact.

23. Infection experiences include

    - initial infection where a flu-like illness occurs
    - an infected stage where no symptoms yet occur but a blood test would be positive
    - an infected and ill stage where fatigue, fever, night sweats, dry cough, diarrhea, swollen lymph glands, memory loss, confusion, and depression may occur
    - an infected and diagnosed stage where the disease is accompanied by certain infections such as pneumonia, certain cancers, and mental disorders

24. HIV is detected through a blood test for the presence of antibodies.

25. Treatment for infections and cancers that accompany AIDS may extend the life of the infected person.

26. Most common conditions include

    - a discharge of pus from genital or urinary openings
    - pain in urination, a burning sensation
    - itching around the genitals
    - sores or a rash around the genitals
    - lower abdominal pain in women

Section 1: Follow-up Activities

Extra Help

1. a. ii
   b. viii
   c. xi
   d. v
   e. iv
   f. vii
   g. iii
   h. vi
   i. ix
   j. x
   k. i

2. a. ovaries b. uterus c. Fallopian tubes d. vagina e. cervix

3. The head and acrosome are visible as well as the middle piece and the beginning of the tail.

4. The alkaline pH of the semen would neutralize the acidic environment of the vagina allowing sperm cells to live longer. The prostate gland secretes an alkaline substance.

5. Use videos of people with STDs explaining symptoms and treatment. Do a research paper on the most common types of STDs. Bring in a doctor or health nurse for a discussion or question-and-answer period. Contact a health clinic for brochures.

6. a. prostate gland
   b. acrosome
   c. cervix
   d. menopause
   e. Cowper's gland
   f. testes
   g. scrotum
   h. oviduct (Fallopian tube)
   i. uterus
   j. testosterone
   k. vas deferens
   l. epididymis
   m. Sertoli cells
   n. seminiferous tubules
   o. seminal vesicles

7.

STD	Symptom	Treatment
Gonorrhea	male – painful urination female – lower abdominal pains	antibiotics
Chlamydia	male – itching and burning in urethra female – abdominal pain vaginal discharge	antibiotics
Herpes Type II	blisters and rash on genitals, fever	no cure
AIDS	illness, respiratory infections, skin tumours	no cure

8. a. Untreated PID can cause blockages in the Fallopian tubes and damage the ovaries. The sperm will not be able to reach the egg; thus, fertilization and pregnancy cannot occur. If the ovaries are damaged ovulation may not occur.

   b. They are similar in that, in most cases, they are sexually transmitted diseases that have no cure. They are different in how they affect the body. AIDS infects and reduces the immune system making other infections possible. AIDS is fatal. Herpes causes fever blisters but is not fatal.

9. The virus or bacteria may be found in the fluids of the reproductive system that are produced by either males or females. From the fluids, they must pass through an opening to the blood system, either on the outside or inside of the body. Viruses or bacteria cannot pass directly through skin; therefore, skin contact with doorknobs or toilet seats will not result in acquiring a disease.

Enrichment

1. - **Textbook question 1**: It is likely that sperm production would be impaired or prevented by the higher temperature than when the testes are found within the scrotum.

   - **Textbook question 3**: Semen provides nutrients for the sperm cell and contains buffers that protect sperm cells from the acidic environment of the vagina. Without the semen, sperm could not survive for any length of time in the vagina and would likely die before reaching the ovum.

2. Vaginitis – An inflammation or irritation of the vagina causing increased vaginal discharge, itching, and a burning sensation. It can be caused by chemicals, too much heat and moisture, or by bacterial or yeast infection. It can be treated by antibiotics.

   Prostatitis – An inflammation or infection of the prostate gland that also increases the risk of bladder infections. The prostate enlarges, as in prostate cancer, making urination difficult or painful. This may be treated with antibiotics or surgery.

3. You can go to your local hospital, health clinic, doctor's office, or library to find books, pamphlets, or magazine articles on these diseases.

4. Hepatitis B is a serious liver disease. The Canadian Liver Foundation welcomes inquiries by mail or phone.

Section 2: Activity 1

1. a. A zygote is the cell resulting from the union of a male and female gamete or a sperm and an egg.

b. A blastocyst is an early stage of embryo development. Through cell division the embryo now consists of many cells.

c. Implantation is the attachment of the embryo to the endometrium.

2. The change in the egg's membrane prevents more than one sperm from penetrating. Once one sperm cell enters the egg, the new cell has the exact number of chromosomes (forty-six) needed to make a human. If more sperm cells entered, there would be too many chromosomes, too many instructions, and development would be impaired.

3. Only a few hundred to several thousand sperm cells reach the Fallopian tubes. The rest are destroyed by harsh conditions in the vagina and uterus. This may be an example that only the strongest survive.

4. A pregnancy usually cannot occur if intercourse takes place three days or longer after ovulation. The egg only lives for twelve to twenty-four hours after being released from the ovary. Three days is about the limit for sperm survival.

5. a. Ovulation occurs in the ovary as the egg is released from the follicle into the Fallopian tube.

   b. Fertilization usually occurs in the upper portion of the Fallopian tube.

   c. Implantation usually occurs in the upper portion of the uterus.

6. The sperm cell leaves the urethra of the penis and enters the vagina. It travels up the vagina, passes through the cervix, through the uterus, and enters the Fallopian tube. It will travel through the Fallopian tube where it meets and fertilizes the egg.

7. No, the embryo will not be able to complete development. If the zygote attaches to the inside of the Fallopian tube, it is called an ectopic pregnancy. This can become a life-threatening condition for the woman. The embryo will begin to develop, but since there is no room for expansion, the tube may rupture in the second or third month of pregnancy. Symptoms include severe abdominal pain and internal bleeding. This can be fatal for the mother and the embryo.

8. When a woman becomes pregnant, the levels of estrogen and progesterone in her body remain high. High levels of estrogen and progesterone maintain the endometrium. The endometrium and embryo remain in the uterus instead of being shed during menstruation.

9. No, she will no longer be pregnant. If menstruation occurs, the endometrium will be shed and with it the embryo. This is called a miscarriage. The embryo and fetus are sustained by their attachment to the endometrium through the placenta. If the endometrium is shed during a menstrual period, this attachment is broken.

10. HCG stands for human chorionic gonadotropin. This hormone causes the corpus luteum in the ovary to continue producing estrogen and progesterone which maintains the endometrium.

11. Two changes that occur include the following:

    - The number of cells increases.
    - Cells start to differentiate into the chorion, amnion, and embryo.

12. If the embryo does not attach to the uterus, it will not be able to get the nutrients needed to continue to grow, and therefore it will die.

Section 2: Activity 2

1. a. The chorion is the outer membrane of a developing embryo which forms the fetal portion of the placenta.

   b. The amnion is the fluid-filled membrane that surrounds and keeps the embryo/fetus suspended in amniotic fluid. The amniotic fluid cushions the fetus from shock.

   c. The placenta is the structure that attaches the embryo or fetus to the mother. It is the site of exchange of nutrients and wastes between maternal and fetal blood.

   d. The umbilical cord connects the fetus and the placenta. It carries fetal blood to and from the placenta. Diffusion of nutrients and dissolved gases occurs between the placenta and the endometrium.

2. Extraembryonic membranes form from cells in the blastocyst that are not used to form the embryo. They include the amnion, chorion, allantois, and yolk sac. The embryonic membranes form from cells in the blastocyst that are used to form the embryo. They develop into the three germ layers; endoderm, ectoderm, and mesoderm; that will produce all the body systems.

3. a. Nutrients and oxygen diffuse from the mother's blood into the fetal blood. They diffuse in this direction because the mother's blood has more nutrients and oxygen than the fetal blood. The fetus has no access to food or air other than through the placenta. The mother's blood does not cross the placenta, only substances dissolved in the blood which cross by diffusion can pass through the placenta.

   b. Wastes and carbon dioxide diffuse from the fetal blood into the mother's blood. The concentration of these substances increases in the fetal blood. The fetus cannot get rid of most of its waste products using its own systems while in the uterus. The wastes, therefore, build up in the fetal blood and diffuse through the placenta into the maternal blood and are then eliminated by the mother.

4.

Body System	Germ Layer Origin
circulatory	mesoderm
nervous	ectoderm
muscular	mesoderm
digestive (lining)	endoderm
reproductive	mesoderm
excretory (kidney)	mesoderm
respiratory (lining)	endoderm

5. The dark circles are the nuclei of the egg and sperm cells. Each nucleus contains twenty-three chromosomes. The chromosomes contain the instructions used to control and determine the development of the embryo.

6. The cells in Slide 4 would be half the size of the cell in Slide 3. Cells do not grow after they divide. The cells in Slide 4 occur after one division of the cell in Slide 3. There are two cells in Slide 4 and only one in Slide 3.

7. The villi provide firm attachment of the placenta and a large surface area for diffusion.

8. The arms and legs would form from the limb buds (labelled *L* on the diagram in description 8).

9. It would take five divisions to form the thirty-two-celled embryo in Slide 6 from the single-celled zygote in Slide 3. (1 cell → 2 cells → 4 cells → 8 cells → 16 cells → 32 cells)

10. The structure in Slide 6 would not contain any extraembryonic membranes. At this point no tissue (membrane) formation has occurred.

11. Around the ninth week of pregnancy the embryo is called a fetus.

12.

Trimester	Duration	Length of Embryo/Fetus	Changes
1	0 – 3 months	4 mm – 7 mm	formation of all body systems, heart, brain, limbs, fingers, and toes
2	3 – 6 months	7 mm – 57 mm	all organ systems formed, growth of hair, eyelids, eyebrows, and bone
3	6 months – birth	57 mm – 530 mm	organs become more developed, body mass increases

13. The sex of the fetus can be determined around the ninth or tenth week after conception. At this time the genes of the sex chromosomes cause the development of either male reproductive organs or female reproductive organs and differentiation.

14. The hormone responsible for the development of reproductive structures is testosterone. In the male fetus, testosterone is produced in greater quantities resulting in the development of male reproductive structures. The lack of testosterone in the female fetus results in the development of the female reproductive structures.

15. The woman's water breaking refers to the amniotic membrane breaking and releasing the amniotic fluid. In order for the amniotic membrane to tear and release the amniotic fluid surrounding the baby, the uterus must contract to push the fetus into the cervix. These contractions indicate the beginning of labour which eventually leads to the birth of the baby.

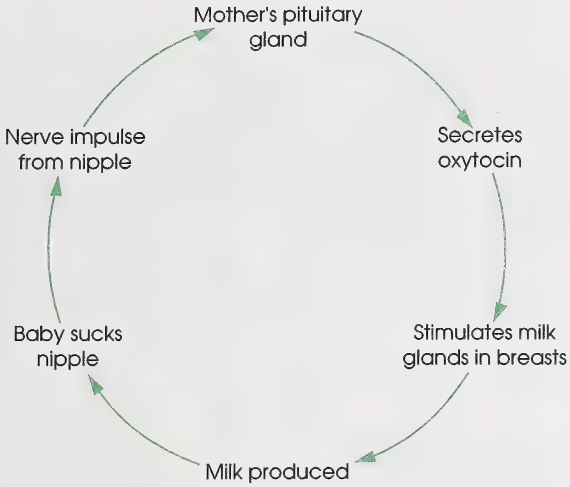
16. Relaxin is a hormone produced by the placenta prior to labour. It causes the ligaments within the pelvis to loosen, providing a more flexible passageway for the fetus during delivery. Oxytocin is a hormone produced by the posterior pituitary gland. It causes the strong contractions of the uterine muscles that force the baby down and dilate the cervix.

17. When progesterone levels decline, oxytocin production increases. Increasing oxytocin causes contractions of the uterine muscles, eventually ending in birth.

18. Women who haven't recently given birth are not capable of producing the hormone prolactin. This hormone stimulates the glands in the breast to produce milk.

19. Colostrum is the fluid produced by the breast. It contains milk, sugars, milk proteins, and antibodies, but no milk-fat. It is produced in the few days after the birth of a child when the breast is not yet capable of producing milk.

20.



Section 2: Activity 3

1. Three factors that could affect the chromosomes in sperm cells are heavy metals, radiotherapy, and cocaine abuse.

2. An abnormal sperm cell could have chromosome abnormalities. If there are incomplete chromosomes or damaged chromosomes, the instructions for the development of the fetus will be altered thus affecting its development.

3. A miscarriage is the spontaneous expulsion of the embryo or fetus and placenta before the middle of the second trimester. After this time the loss of the fetus is termed a "still birth." Many factors can lead to a miscarriage.

4. Alcohol consumption by pregnant women has been linked to disorders in newborn babies (FAS). Disorders include low birth weights, possible mental defects, and heart and nervous disorders. By refraining from drinking alcohol during their pregnancy, women will decrease the risk of having a baby with a disorder.

5. a. Pregnant women should not be allowed to purchase alcohol. Women who consume alcohol during pregnancy and cause FAS should be held responsible.

   b. Preventing pregnant women from buying alcohol will not necessarily stop them from drinking alcohol. Greater awareness of FAS is needed.

6. Alcohol abuse could cause developmental problems with sperm cells. Another possible situation could be where an alcoholic father physically abuses the pregnant woman causing physical harm to the embryo or fetus.

7. Doctors and dentists could inadvertently prescribe drugs for their patients that could harm the embryo or fetus. Upon entering the mother's blood stream, these drugs may cross the placenta, enter the fetal blood, and cause unintentional effects. X-rays are also to be avoided during pregnancy.

8. If heart rate or blood pressure in the mother is reduced, the delivery of nutrients and oxygen to the fetus and the removal of wastes through the placenta is slowed. Over the long term this could affect the growth and development of the fetus. This could be most critical at particular times during development.

9. During the first pregnancy and during birth when the placenta separates from the uterus, small amounts of Rh^+ fetal blood may leak into the mother's bloodstream. The mother's blood system will develop antibodies to the Rh^+ proteins. These antibodies take time to develop. The first baby escapes by being born. However, a second or third Rh^+ baby could be affected by antibodies that cross the placenta during these latter pregnancies. The first pregnancy leaves the mother sensitized to Rh^+ blood.

10. Blood transfusions of Rh^- blood into the fetus via the umbilical cord or into the newborn right after birth have been used to save babies whose blood is being destroyed by the mother's antibodies. A more common procedure is to treat the Rh^+ mother to prevent the formation of antibodies. Your text describes this as a procedure done after the first pregnancy, but actually it is now done during the first trimester of the first pregnancy as a preventative measure. This is one reason for knowledge of parental blood types of couples hoping to have children.

11. No, women with Rh^+ blood need not be concerned. Their blood will not produce antibodies against the Rh protein.

12.

Mother	Fetus	Compatibility
Rh^-	Rh^+	incompatible
Rh^-	Rh^-	compatible
Rh^+	Rh^+	compatible
Rh^+	Rh^-	compatible

Section 2: Follow-up Activities

Extra Help

1. A gamete is a sperm or an egg. It has only half the required genetic material for life. A zygote is the combination of sperm and egg formed by fertilization. An embryo is a zygote that has increased its numbers of cells and is starting to show cell differentiation and specialization.

2. Fertilization describes the union of sperm and egg.

3. The placenta is a barrier between mother and fetus to large blood components like blood cells and large proteins. It is a passageway for diffusion of dissolved gases like oxygen and carbon dioxide, nutrients, and wastes.

4. a. Sertoli cells

   b. epididymis

   c. Sperm, sugar (fructose), prostaglandins, alkali solution, and mucus make up semen. Sperm will be missing if a male has had a vasectomy.

   d. Estrogen promotes development of secondary sex characteristics and initiates growth of the endometrium in the uterus. Progesterone promotes further development of the endometrium and inhibits uterine contractions and ovulation.

5. Drugs could cross the placenta by simple diffusion.

6.

							[a]H	[b]C	G										[c]F
								H			[d]P								E
						[e]I		O		[f]B	L	A	S	T	O	C	Y	S	T
				[g]F		M		R			A								U
				I		P		I			C								S
				R		L		O			[h]E	M	B	R	Y	O		[i]T	
				S		[j]A	M	N	I	O	N							H	
[k]F				T		N					T							I	
E				T		T		[l]R	E	L	A	X	I	N				R	
R				R		A												D	
T				I		T												T	
I			[m]U	M	B	I	L	I	C	A	L	C	[n]O	R	D			R	
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I				S		N							Y					M	
[o]Z	Y	G	O	T	E		[p]P	R	O	L	A	C	T	I	N			E	
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Enrichment

1. *A New Life* and *Into the World* are parts of the *Living Body* series by

Films for the Humanities & Sciences Inc.
Box 2053
Princeton N.J. 08543-2053
USA
Phone: 1-800-257-5126

2. German measles (rubella virus) infects the mother but has a greater impact on the fetus. It may lead to the malfunction of several of the baby's organs including the eyes after birth. The result can be mental retardation and blindness.

3. Back issues of *Discover* magazine may be available at your local library.

4. - **Textbook question 4**: Even a few cells in the embryo may represent organs or organ systems in the adult organism. So when genes are altered in a cell of an embryo, such alterations may produce serious effects in organs or organ systems in the fully formed fetus.

Section 3: Activity 1

1. Natural methods include abstinence, withdrawal, and rhythm. Of these methods, only abstinence is 100% effective. Knowledge of the fertility cycles is also very important for couples who wish for fertilization to occur. Conception is most likely to occur if intercourse takes place near the time of ovulation. Determining ovulation then becomes important. Changes in body temperature can also be used to determine when ovulation has likely occurred.

2. a. Yes, a man who has had a vasectomy can still produce semen. Cutting and tying off the vas deferens will not impair the function of the Cowper's or prostate gland or the seminal vesicles. These glands will continue to produce seminal fluids. However, the semen will not contain sperm cells.

   b. Yes, a man who has had a vasectomy can still have sexual intercourse. Cutting the vas deferens will not affect this process.

3. a. Surgery is needed for a tubal ligation and a vasectomy.

   b. Hormone control is used in oral contraceptives.

   c. The barriers that prevent sperm and egg from meeting are tubal ligation, vasectomy, condom, and a diaphragm. A spermicidal foam may increase effectiveness.

4. a. The methods used only by females are tubal ligation, oral contraceptives, douche, I.U.D., diaphragm, and spermicide.

   b. Methods on this table used only by males include vasectomy and condom.

   c. Methods on this table used by both male and female are abstinence, withdrawal, and rhythm.

5. a. The most effective methods of birth control listed on this table are abstinence, tubal ligation, vasectomy, oral contraceptive, and the I.U.D. The only method with a 100% success rate is abstinence.

   b. Douche is reported as least effective.

6. The I.U.D. prevents implantation.

7. Ultrasound can be used to detect the fetal position. It can also show general physical features of the baby (limbs, hands, feet, head, sex organs, and size). The action of the heart and movements of the limbs can also be viewed with ultrasound imaging.

8. Amniocentesis involves withdrawing amniotic fluid from the womb. This fluid contains a watery liquid and fetal cells.

9. The three tests that can be performed include a chemical analysis of the liquid portion of the amniotic fluid, an analysis of the chromosomes in the fetal cells of the amniotic fluid, and a chemical analysis of the fetal cells found in the amniotic fluid.

10. Similarities: They both provide information about the fetus.

    Differences: With amniocentesis a fluid is withdrawn from the womb; with ultrasound no fluid is withdrawn; ultrasound requires no needles, only the use of sound. Amniocentesis involves chemical testing and examining of chromosomes. Ultrasound involves looking at an image of the fetus.

11. *In vitro* means fertilization occurs outside the female's body. The opposite of this is *in utero* which means in the uterus.

12. The steps involved include the following:

    - inserting a laparoscope into the woman's abdomen to locate the ovary
    - extracting an egg (eggs) from the ovary
    - placing the egg (eggs) in a petri dish to be fertilized by sperm
    - following a brief incubation period, transferring one or more embryos into the uterus for implantation

13. The term *test-tube baby* is inaccurate because the process of in vitro fertilization does not use test tubes. As well, only conception occurs outside the woman's body; all other development of the baby occurs in the mother's uterus.

Section 3: Activity 2

1.

Reproductive Technology	**Implications for Human Life**	
	Advantages	**Disadvantages**
Amniocentesis	• detects some fetal defects	• creates dilemmas about future of fetus • is a risk to fetus
Ultrasound	• detects some fetal defects	• creates dilemmas about future of fetus • misuses technology and information
In vitro Fertilization	• enables couples to have a child who could not normally conceive	• creates ethical issues such as what to do with extra embryos

2. **Textbook question 3**: Answers depend on a number of variables including the different beliefs that you may bring from your family, cultural, and religious orientations. However, being able to select the sex of unborn children would give people ultimate power over the defenceless unborn. At any rate, the answers would probably allude to the fact that a change in the ratio of male and female births would produce an unbalanced population which would become even more unbalanced over time.

3. As people age, and as family size (number of children) increases, the use of sterilization becomes more common because a choice is made not to have any more children. Instead of continuing to use a contraceptive to avoid pregnancy, people may choose to eliminate the risk permanently by becoming sterilized.

4. The use of oral contraceptives generally decreases with age and number of children. The reason for this is probably the same as in question 3. As women get older or their family size increases, they stop using contraceptives and are sterilized so they don't have to bother with contraception anymore. Many women also experience side-effects from long-term use of oral contraceptives.

5. Birth control probably has helped to slow population growth. Many other factors such as income, education, food supply, and perceptions also have an effect on population growth rate.

Section 3: Activity 3

1. A surrogate mother is a woman who allows her womb to be used to develop an in vitro fertilized egg from another woman.

2. These technologies should be encouraged because they can help people have children who would otherwise not have been able to have them. However, the development of these technologies also creates unsolvable problems such as defining who is the baby's mother. You could also argue that these techniques could be abused for immoral or unethical reasons such as to grow a fetus that would be terminated so its tissues could be used for research.

3. Opinions on this issue will vary; your answer could include the following:

   - Societal rights may differ from individual rights.
   - Allocation of funds for medical/scientific research may be questioned in terms of greatest benefit.
   - The rapid growth of the world population may leave few choices.

4. Point – Research into reproductive technology can also help to avoid possible serious problems that develop during pregnancy. For example, Rh incompatibility may be treated in the mother before a fetus is affected.

   Counterpoint – The information obtained could be misused or misinterpreted and create other equally serious problems. For example, a society that can determine the sex of an unborn child may decide to encourage abortions of particular fetuses.

5. Many answers are possible. A sample is given.

   Point – Only the scientific community fully understands the reproductive system and implications of reproductive technologies.

   Counterpoint – Reproductive technology can impact all levels of society; therefore, more than just scientists and doctors should be involved in the decision.

Section 3: Follow-up Activities

Extra Help

1. a. amniocentesis
   b. in vitro fertilization
   c. amniocentesis
   d. birth control
   e. ultrasound
   f. birth control
   g. ultrasound
   h. in vitro fertilization

2. a. Contraception is a method of birth control that prevents fertilization from occurring.

   b. Ultrasound is a reproductive technology that uses sound to form a picture of the fetus.

   c. Amniocentesis is a reproductive technology that draws amniotic fluid from the womb so it can be tested for genetic defects.

   d. In vitro fertilization is a reproductive technology that involves the fertilization of an egg outside the body.

3.

Method	Advantages	Disadvantages
Artificial	• generally more effective • more reliable	• physical side effects • inconvenience of some
Natural	• no health risk or physical side effects • no cost	• not as reliable • require motivation and knowledge

4.

Technology	Implications
Birth Control	• reduced population • decreased family size • having to choose when to have children
Ultrasound	• prior knowledge of birth defects, position, and sex of baby • use of this information becomes a question • possible termination of fetus based on sex or physical qualities
Amniocentesis	• prior knowledge of birth defects and sex of baby • use of this information becomes a question • possible termination of fetus based on sex or physical or mental condition
In vitro Fertilization	• more pregnancies, increased family size and population

Enrichment

1. a. This video examines some of the modern techniques used to test for fetal disorders. It also examines some of the implications of their use.

   b. This video presents a situation where a husband and his wife are in disagreement about what to do about a baby she is carrying.

2. Health clinics usually have public literature on a wide variety of health concerns. Some clinics may be involved in prenatal classes or in genetic counselling. Ask for information.

3. Research into fetal development has brought much new information about fetal anatomy and behaviour. Some groups in society look at this information as evidence that life begins at conception. Other groups use the information to determine that life begins when the heart starts beating, when the fetus starts moving, or when the brain begins to function.

4. a. Yes.

   b. No. Ovulation (the release of the egg) can occur before the first period starts.

   c. Yes. Condoms are very good protection against infection but not 100% effective.

   d. No. Girls can get pregnant if they have sex during their period – it is often difficult to calculate when the egg will be released.

   e. Yes. Sperm can live three to five days in the uterus.

   f. Yes. Many pregnancy tests are accurate ten to fourteen days after intercourse. It is a good idea to have a test done at a doctor's office or clinic.

   g. No. Males are fertile every day after puberty.

   h. Yes.

   i. No. The pill does not prevent sexually transmitted diseases. It is important to use a condom with the pill.

j. No. Sperm and sexually transmitted infections can be released in the pre-ejaculation fluid (i.e., the small amount of fluid released before the final ejaculation).

k. Yes. If sperm are released near the vagina it is possible for pregnancy to occur.

l. No. Some sperm may be released before the male ejaculates. A condom should be put on as soon as the penis is erect before any genital contact.

m. Yes. Used together, foam and condoms are good protection in preventing pregnancy and also good protection against infection.

n. Hopefully your community has a birth control centre where you can get information if you wish to. Check your local telephone directory under Birth Control, Family Planning, or Sexual Health, or your health unit. There are five major birth control centres around the province. You can contact any one of them for confidential medical or reproductive information.

The Birth Control Centre
#200, 10036 Jasper Avenue
Edmonton, Alberta
T5J 2W2
Phone: 425-5850

Red Deer Regional Health Unit
Sexual Health Program
2845 Bremner Avenue
Red Deer, Alberta
T4R 1S2
Phone: 341-2100

Family Planning Clinic
Calgary Health Services
323 7 Avenue SE
Calgary, Alberta
Phone: 264-3454
If busy call 246-3631

Teen Clinic
Fort McMurray and District Health Unit
9921 Main Street
Fort McMurray, Alberta
T9H 4Y5
Phone: 743-3232

Sexual Health Centre
Lethbridge Health Unit
801-1 Avenue South
Lethbridge, Alberta
T1J 4L5
Phone: 320-0110

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Student Module Booklet
Module 3
L.R.D.C.
Producer 1994